A8640-1

1982 TELECOMMUNICATIONS EQUIPMENT INDUSTRY

STATISTICAL REVIEW

NORTH AMERICAN TELEPHONE ASSOCIATION

IN COOPERATION WITH
THE
EASTERN
MANAGEMENT
GROUP

NATA
511 2nd Street, N.E.
Washington, D.C. 20002
(202) 547-4450

Copyright © 1982 by The North American Telephone Association, Inc. All rights reserved. This publication, or the contents thereof, may not be reproduced or in any other manner used without the express written consent of the Board of Directors of the North American Telephone Association.

CONTENTS

PREFACE 3

INDUSTRY OUTLOOK 4

INSTALLED BASE DEVELOPMENT

Development at a Glance 6
Business Telephone Instruments (1970-1981) 7
PBX Market (1977-1981) 8
Key Market (1977-1981) 9
Bell PBX Movement by State (1981) 10-11
PBX Distribution by City (1981) 12

INSTALLED BASE PROJECTIONS

Projections at a Glance 14
Business Telephone Instruments (1981-1986) 15
PBX-Key Market (1981-1986) 16
PBX Market (1981-1986) 17
Key Market (1981-1986) 18
Interconnect Industry Growth and Revenues (1981-1986) 19
The Eastern Management Group's Forecast ... 20-22

DATA BASE

Carrier Telephone Instruments (1883-1981) ... 24
Telephone Development by States (1981) 25
Telephone Development by Large Exchange Area (1980) 26-36

FOREIGN TRADE

U.S. Balance of Trade (1981) 38

GLOSSARY 40

PREFACE

The **1982 Telecommunications Equipment Industry Statistical Review** is designed to provide a coherent and up-to-date picture of the business telephone equipment market in the U.S. The findings contained herein are based on the available data and a reasonable set of assumptions.

The **1982 Review** differs from earlier editions in two significant ways. First, NATA has revised its previous assumptions and projections, a reappraisal necessitated principally by the unexpected divestiture of the Bell System. Second, information contained in the **Review** has been reorganized into seven sections: Preface, Industry Outlook, Installed Base Development (1970-1981), Installed Base Projections (1981-1986), Data Base, Foreign Trade and Glossary. We believe the new format will help the reader make better use of the statistical material.

This year's **Review** can be distinguished from its predecessors in another major way: the inclusion of information furnished by The Eastern Management Group. Because NATA appreciated many of the insights derived from Eastern Management's study ("PBX Markets and Competitors: A Ten-Year Strategic Analysis"), we are delighted to have the opportunity to work with its principals in the preparation of this **Review.** The Eastern Management Group material appears on pages 12 and 20-22.

The major sources of NATA's study have been FCC and USITA statistics. In addition, NATA has conducted an informal survey of a wide range of industry participants in an effort to round-out our picture of the interconnect side of the industry. Finally, some recent studies of the industry have been reviewed, and a number of independent analysts consulted, to ensure no significant aspects of the industry were overlooked. While these studies and independent experts were extremely helpful, the data and assumptions contained in this **Review** are entirely those of NATA.

A final observation about the data contained in this **Review.** For a variety of reasons (primarily the availability of data), NATA has focussed almost exclusively on measuring the installed base of business telephone instruments, both as it has developed in the past and as it is projected to develop in the future. This form of analysis concentrates on cumulative equipment installations and provides a series of year-end snapshots of various industry participants, showing the number of instruments and systems in their respective installed bases, their market share, and annual growth rates.

Unfortunately, installed base statistics present an inadequate and often misleading picture of actual activity in the marketplace over a given year. Tables on installed base development show only the *net* gain or loss within a given market segment. This net figure fails to account for the tremendous amount of business activity, especially on the part of Bell and independent carriers, designed to replace or upgrade their existing base of equipment. This activity, called churn, accounts for the bulk of marketplace transactions in a given year.

As an example, the table, "PBX MARKET: 1977-1981" (page 8) might seem to indicate that the interconnect industry far outperformed the Bell System in 1981, with a net increase of 758,000 instruments compared to a net increase of 303,000 instruments for the Bell Operating Companies. However, a comparison of the tables "BELL PBX MOVEMENT BY STATE: 1981" (pages 10-11) and "INTERCONNECT INDUSTRY PROJECTED MARKET GROWTH AND REVENUES: 1981-1986" (page 19) presents a radically different picture. Looking at the figures, we see that Bell installed almost 3.5 million PBX instruments in 1981 ("inward movement"), while interconnect installed only 830,000 PBX instruments in the same year. These figures indicate that interconnect accounted for only about 19 percent of all PBX installations in 1981; phrased another way, Bell installed five times as many PBX instruments as the interconnect industry.

The Eastern Management Group's findings (pages 20-22) are particularly instructive on the subject of churn.

INDUSTRY OUTLOOK

The most striking characteristic of the business telephone equipment market in 1982 has been confusion. A weak economy in 1982 and an uncertain outlook for 1983, combined with an unclear picture of exactly how the divestiture of AT&T will take place, has produced the most confused market conditions since the *Carterfone* decision in 1968.

The confusion has caused a slight decline in the interconnect industry's growth rates in the past year (1981-1982). While some relief is foreseen for 1983, a return to the spectacular growth rates of the 1970s is not expected. Instead, moderate interconnect growth rates will prevail, at least through 1986.

On the plus side, the interconnect industry has proven experience in a highly competitive marketplace and will continue to have available a steady supply of state-of-the-art equipment.

Factors that are expected to contribute to a moderation of interconnect growth include: continued high interest rates coupled with poor economic conditions; potential sales of Bell's installed base of business telephone equipment during the year-long transition period preceding divestiture in 1984; the emergence of unregulated American Bell as a potent market force in 1983; the winding down of Bell's Migration Strategy, which has artificially stimulated demand in the past few years; and the near saturation of some submarkets.

Highlights

The following summarizes NATA's projections for *interconnect industry development* in the next five years.

- Installed base growth of business telephone instruments will average about 19% between 1981 and 1986, down from an annual average of 25.4% between 1977 and 1981 and 51.1% between 1972 and 1977.
- Market share of business telephone instruments will increase to 22% in 1986, up from 12% in 1981.
- Installed base growth of PBX instruments will average 17.5% between 1981 and 1986, down from 23.6% between 1977 and 1981.
- Market share of PBX instruments will increase to 31% in 1986, up from 18.9% in 1981.
- Installed base growth of Key instruments will average 24% between 1981 and 1986, down from 32.4% between 1977 and 1981.
- Market share of Key instruments will increase to 19.5% in 1986, up from 8.9% in 1981.
- Growth in annual revenues from sales to end-users will increase 22% between 1981 and 1982, 33% between 1982 and 1983, but then level off substantially to only a 4% increase between 1985 and 1986.
- Growth in annual revenues from other sources (servicing and selling add-on equipment, such as data terminals, to established customers) will almost triple between 1981 and 1986 from $287 to $753 million.

Divestiture/Deregulation

The court-ordered divestiture of the Bell System, combined with the FCC's efforts to deregulate much of the industry, will significantly reshape the market over the next few years. Although the full scale and exact dimensions of that restructuring cannot yet be calculated, the general picture of the new landscape created by divestiture and deregulation can be outlined.

Starting on January 1, 1983, the Bell Operating Companies (BOCs) will be barred from providing new customer premises equipment. The BOCs will continue to service and maintain existing systems, and with permission of state utility commissions, will be able to sell off those existing systems. (It should be noted that Bell's current plans call for a sell-off of in-place single-line systems only, but that could change.)

As of January 1, 1983, AT&T's new subsidiary, American Bell, Inc., will provide all new telephone equipment for the Bell System, on an unregulated basis. American Bell will be free to sell or lease equipment, at prices not subject to tariffs or government review. Sometime around January 1, 1984, the actual divestiture of the BOCs from AT&T will occur. At that time, all of Bell's in-place telephone equipment, except that associated with Centrex systems, will be transferred from the BOCs to American Bell. And after January 1, 1984, the divested BOCs will be free to market (but not manufacture) new customer premises equipment on an unregulated basis. Both American Bell and the divested BOCs are expected to compete vigorously in the deregulated market.

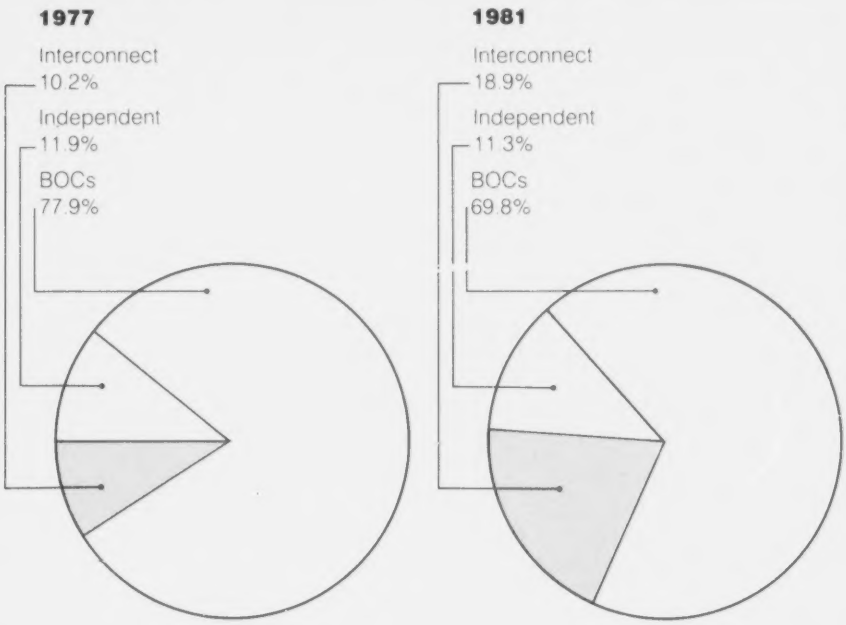
Factors which still remain unclear regarding the forthcoming divestiture and deregulation of the terminal telephone equipment market include the exter[illegible]ich the BOCs will be allowed o[illegible]uraged to sell off their installed base of telephone equipment during the transition preceding divestiture, their ability to dispose of existing equipment inventories, and the valuation of equipment actually transferred from the BOCs to American Bell upon divestiture.

Unforeseen developments in any of these areas could substantially affect the projections contained in this study.

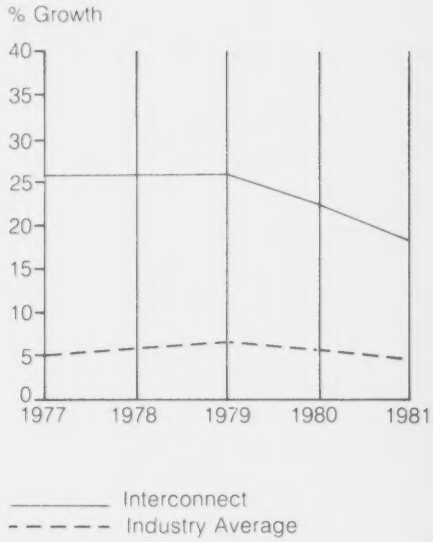
INSTALLED BASE DEVELOPMENT

DEVELOPMENT AT A GLANCE

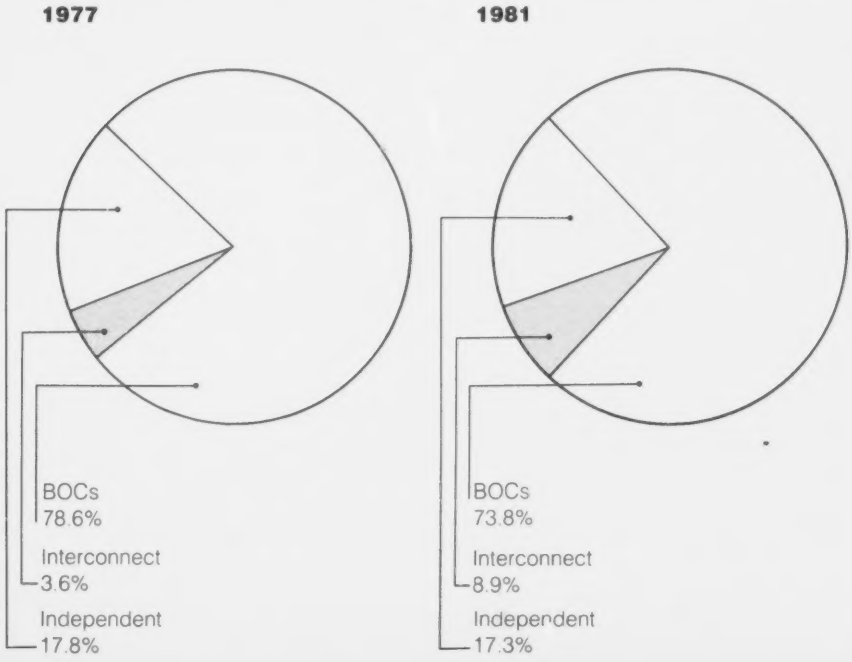
PBX MARKET SHARE: 1977/1981



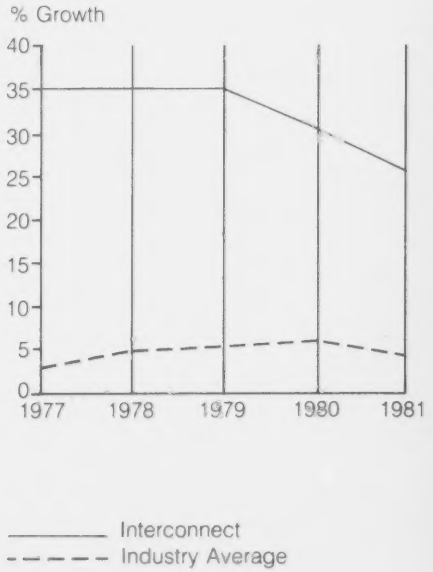
PBX MARKET GROWTH RATE: 1977-1981



KEY MARKET SHARE: 1977/1981



KEY MARKET GROWTH RATE: 1977-1981



BUSINESS INSTRUMENT INSTALLED BASE DEVELOPMENT

BUSINESS TELEPHONE INSTRUMENT MARKET: 1970-1981

(000)

Year	Interconnect Inst.'s	Interconnect Growth	Carrier Inst.'s	Carrier Growth	Total Inst.'s	Total Growth	Interconnect Share
1981	6,505	19.8%	47,780	1.2%	54,285	3.1%	12.0%
1980	5,430	23.9%	47,214	2.7%	52,644	4.6%	10.3%
1979	4,383	27.8%	45,952	3.8%	50,335	5.5%	8.7%
1978	3,430	27.7%	44,284	4.6%	47,714	6.0%	7.2%
1977	2,685	27.6%	42,320	4.0%	45,005	5.2%	5.9%
1976	2,104	30.0%	40,682	3.0%	42,786	4.1%	4.9%
1975	1,618	29.9%	39,498	1.9%	41,116	2.8%	3.9%
1974	1,245	35.0%	38,749	3.5%	39,994	4.3%	3.1%
1973	922	60.1%	37,435	4.0%	38,357	4.9%	2.4%
1972	576	100.7%	35,990	4.5%	36,566	5.3%	1.6%
1971	287	109.5%	34,445	3.4%	34,732	3.9%	0.8%
1970	137		33,305	3.4%	33,442	3.7%	0.4%

(Includes all telephones located on a business premises, including those associated with Centrex, PBX and Key systems, as well as single-line installations.)

Growth of both carrier-provided business instruments and of interconnect instruments was down sharply in 1981, shadowing the general economic downturn last year. Unlike previous periods of slow economic growth, such as 1974-75, the interconnect industry was impacted severely by the record-high interest rates accompanying the current recession. Other forces contributing to the slowdown in the growth of interconnect instruments were uncertainty generated by the much-publicized AT&T antitrust trial, Bell's Migration Strategy and the gradual maturity of the industry after 10 years of spectacularly high growth.

Despite this slowdown, interconnect growth remained well above that for the industry as a whole, and the interconnect industry achieved a 12 percent share of the business telephone instrument market in 1981.

SOURCE: NATA Estimates

PBX INSTALLED BASE DEVELOPMENT

PBX MARKET: 1977–1981					
INSTRUMENTS (000)					
	1977	**1978**	**1979**	**1980**	**1981**
BOCs	16,525	17,089	17,554	18,047	18,350
Growth	2.9%	3.4%	2.7%	2.8%	1.7%
Share	77.9%	76.1%	73.6%	71.7%	69.8%
INDEPENDENT	2,524	2,640	2,848	2,924	2,965
Growth	3.6%	4.6%	7.9%	2.7%	1.4%
Share	11.9%	11.7%	11.9%	11.6%	11.3%
INTERCONNECT	2,174	2,740	3,452	4,211	4,969
Growth	26.0%	26.0%	26.0%	22.0%	18.0%
Share	10.2%	12.2%	14.5%	16.7%	18.9%
TOTAL	21,223	22,469	23,854	25,182	26,284
Growth	5.1%	5.9%	6.2%	5.1%	4.4%
SYSTEMS (000)					
BOCs	122	118	113	109	105
INDEPENDENT	30	32	34	34	35
INTERCONNECT	30	35	42	46	50
TOTAL	182	185	189	189	190

(Includes Centrex)

The interconnect industry has posted strong gains in the past five years in the PBX market, with an average annual growth rate of almost 24 percent between 1977 and 1981, and an increase in market share from 10 percent to 19 percent between 1977 and 1981.

The average system size (instruments per system) of interconnect PBXs has risen steadily, matching a trend for the industry as a whole and in particular reflecting the interconnect industry's expansion into the markets for medium and large systems.

 Source: NATA Estimates

KEY INSTALLED BASE DEVELOPMENT

KEY MARKET: 1977–1981					
INSTRUMENTS (000)					
	1977	**1978**	**1979**	**1980**	**1981**
BOCs	11,167	11,567	11,961	12,449	12,735
Growth	3.3%	3.5%	3.4%	4.1%	2.3%
Share	78.6%	77.6%	76.4%	75.1%	73.8%
INDEPENDENT	2,532	2,646	2,765	2,906	2,979
Growth	4.0%	4.5%	4.5%	5.1%	2.5%
Share	17.8%	17.8%	17.7%	17.5%	17.3%
INTERCONNECT	511	690	931	1,219	1,536
Growth	35.0%	35.0%	35.0%	31.0%	26.0%
Share	3.6%	4.6%	5.9%	7.4%	8.9%
TOTAL	14,210	14,903	15,657	16,574	17,250
Growth	3.3%	4.9%	5.1%	5.9%	4.1%
SYSTEMS (000)					
BOCs	2,233	2,313	2,392	2,490	2,547
INDEPENDENT	506	529	553	581	596
INTERCONNECT	39	53	72	94	128
TOTAL	2,778	2,895	3,017	3,165	3,271

(Includes "stand-alone" systems only, or an estimated 55 percent of the total Key market. Key systems behind PBX represent the rest of the Key market.)

Interconnect growth in the Key market, while not as spectacular as with PBXs, has shown strong gains over the past five years. Annual growth averaged 32 percent between 1977 and 1981, while market share increased from about 4 percent to 9 percent over the same period.

Interconnect vendors traditionally have been more competitive in the large-systems market, reflected in the larger average instrument/system ratio for interconnect than for the carriers (12-13 instruments per system for interconnect vs. 5 for the carriers).

SOURCE: NATA Estimates

BELL PBX MOVEMENT

BELL PBX INSTRUMENT MOVEMENT BY STATE: 1981

	January 1	Inward	Outward	December 31	% Increase (Decrease)
Alabama	220,580	40,402	35,356	225,626	2.3
Arizona	225,399	52,004	41,548	235,845	4.6
Arkansas	95,006	19,539	25,745	88,800	(6.5)
California	2,153,157	328,007	327,480	2,153,684	.02
Colorado	307,405	78,491	58,199	327,697	6.6
Connecticut	348,502	60,297	55,480	353,319	1.4
Delaware	79,242	12,505	10,068	81,679	3.1
D.C.	462,352	93,086	74,618	480,820	4.0
Florida	540,894	116,562	83,514	573,942	6.1
Georgia	410,704	74,754	60,389	425,069	3.5
Idaho	57,282	9,493	7,982	58,793	2.6
Illinois	1,100,932	191,072	189,864	1,102,140	0.1
Indiana	294,386	34,083	30,402	298,076	1.3
Iowa	187,927	46,847	45,794	188,980	0.6
Kansas	161,709	32,687	33,177	161,219	(0.3)
Kentucky	146,681	29,116	31,649	144,148	(1.7)
Louisiana	281,712	73,617	62,632	292,697	3.9
Maine	63,291	9,593	9,691	63,193	(0.2)
Maryland	443,710	101,843	72,096	473,457	6.7
Massachusetts	610,178	135,531	117,767	627,942	2.9
Michigan	738,547	128,951	122,067	745,431	0.9
Minnesota	372,021	89,447	76,488	384,980	3.5
Mississippi	135,845	25,848	21,406	140,287	3.3
Missouri	374,231	95,264	91,772	377,723	0.9
Montana	52,868	7,451	7,713	52,606	(0.5)
Nebraska	84,111	18,706	15,076	87,741	4.3
Nevada	43,331	,0,375	6,896	46,810	8.0
New Hampshire	66,143	10,978	8,483	68,638	3.8
New Jersey	764,641	170,852	125,260	810,233	5.9
New Mexico	93,231	20,011	17,904	95,338	2.3
New York	1,690,747	228,545	288,144	1,631,148	(3.5)
North Carolina	258,873	44,622	33,016	270,479	4.5
North Dakota	49,213	12,902	12,542	49,573	0.7
Ohio	700,057	136,513	160,109	676,461	(3.3)
Oklahoma	220,667	49,006	40,280	229,393	3.9
Oregon	193,547	44,510	29,264	208,793	7.9
Pennsylvania	942,177	154,110	139,952	956,355	1.5
Rhode Island	80,248	13,892	14,403	79,737	(0.6)
South Carolina	180,201	35,187	27,753	187,635	4.1
South Dakota	41,731	10,531	9,067	43,195	3.5
Tennessee	274,366	63,275	58,150	279,491	1.9
Texas	1,109,233	255,781	235,861	1,129,193	1.8
Utah	101,188	20,621	17,926	103,883	2.7
Vermont	29,949	4,924	3,702	31,171	4.1
Virginia	423,286	113,724	76,812	460,198	8.7
Washington	344,770	91,592	73,667	362,695	5.2
West Virginia	102,855	23,666	18,230	108,291	5.3
Wisconsin	345,852	64,671	81,419	329,104	(4.8)
Wyoming	42,084	9,850	5,715	46,219	9.8
TOTAL	18,047,102	3,495,334	3,192,528	18,349,908	1.7

BELL PBX MOVEMENT

(Includes Centrex)

"January 1" indicates the accumulated installed base of PBX instruments for the Bell Operating Companies at the beginning of 1981. "Inward" refers to all PBX instruments installed by the BOCs during the year, whether as additions to existing systems, replacements of older equipment with new equipment, or as completely new installations. "Outward" refers to all PBX instruments removed by Bell during the year. "December 31" shows the net installed base at the end of the year.

An examination of these annual inward/outward movement tables provides an accurate picture of actual Bell activity in the PBX market in 1981. The tables provide a graphic example of why a net increase in installed base development is a poor indicator of actual market activity, given the high rate at which carriers (in this case, Bell) upgrade their existing systems. Note that the actual inward movement of almost 3.5 million telephone sets represents 19 percent of the January 1 installed base, while the net increase of just over 300,000 sets is only 1.7 percent of the same base. This discrepancy arises from what is called "churn", or the replacement of older equipment with newer systems, without any net change in the installed base.

These ratios clearly indicate that the majority of Bell's activity in the PBX market in 1981 involved the systematic replacement and upgrading of its PBX base, and that this program of upgrading is proceeding at a swift pace, a result consistent with goals set by Bell in its Migration Strategy.

SOURCE: FCC Statistics

PBX DISTRIBUTION

PBX DISTRIBUTION BY CITY: 1981
(Systems grouped by line-size)

City	Under 100	100 - 249	250 - 499	500 - 999	1,000 and Over
Atlanta	942	516	162	46	33
Baltimore	805	409	122	50	30
Boston	1,826	1,013	265	131	77
Chicago	3,510	2,042	585	276	166
Cincinnati	631	348	99	48	27
Cleveland	988	558	155	69	45
Columbus (OH)	465	250	76	37	24
Dallas/Ft. Worth	1,419	840	231	96	45
Denver	841	461	106	29	28
Detroit	1,767	828	216	98	93
Houston	1,463	795	228	108	57
Indianapolis	527	269	75	28	23
Kansas City	648	360	96	45	26
Los Angeles	4,010	1,965	572	200	123
Miami	803	409	102	37	22
Milwaukee	750	356	125	50	44
Minneapolis/St. Paul	1,199	683	182	70	50
New Orleans	526	306	85	37	16
New York	3,931	2,165	648	281	199
Oklahoma City	404	177	43	18	8
Phoenix	605	291	76	26	18
Pittsburgh	825	447	136	70	61
Portland	613	291	81	37	16
Philadelphia	1,860	1,094	302	163	79
St. Louis	1,106	561	169	69	48
San Diego	600	281	59	32	16
San Francisco	1,513	751	211	81	59
San Jose	569	294	88	39	25
Seattle	776	341	85	35	22
Washington, D.C.	1,262	639	172	65	37
TOTAL	37,182	19,740	5,552	2,371	1,517

This table, developed by The Eastern Management Group for NATA, estimates the total PBX market, by line size, for the 30 largest metropolitan areas in the U.S. Thirty-five percent (66,362 systems) of the total installed base of PBX systems in the U.S. were located in these 30 urban markets at the end of 1981.

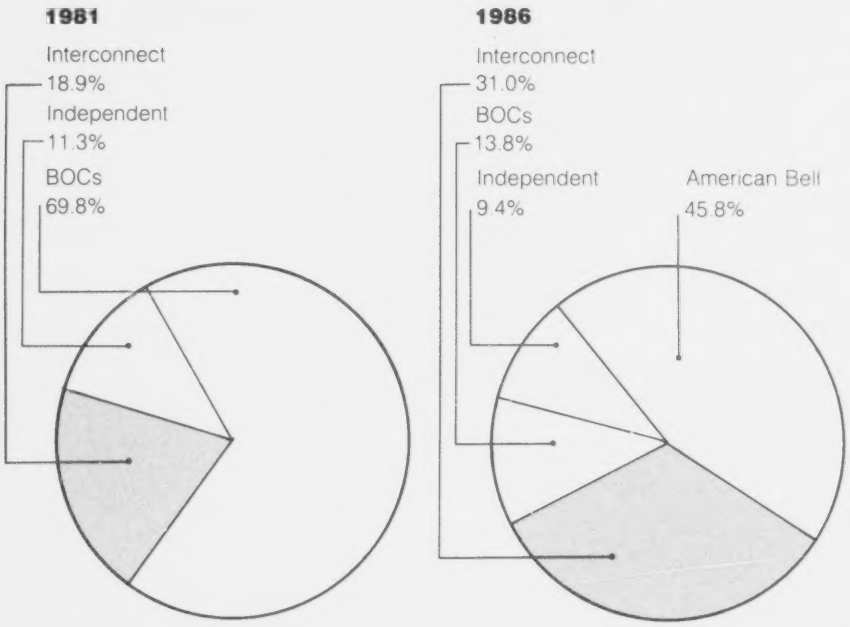
The accompanying chart shows interconnect share of the PBX market's installed base in 15 of these cities.

SOURCE: The Eastern Management Group Estimates

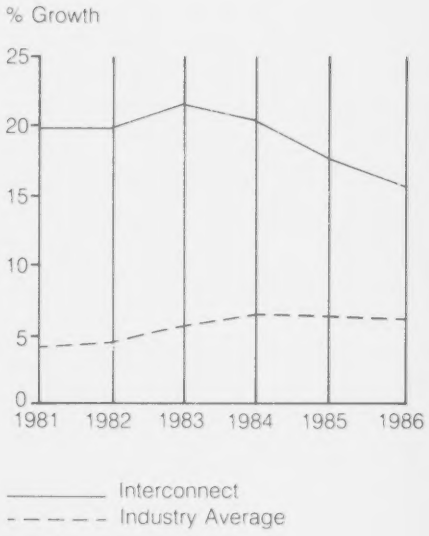
INSTALLED BASE PROJECTIONS

PROJECTIONS AT A GLANCE

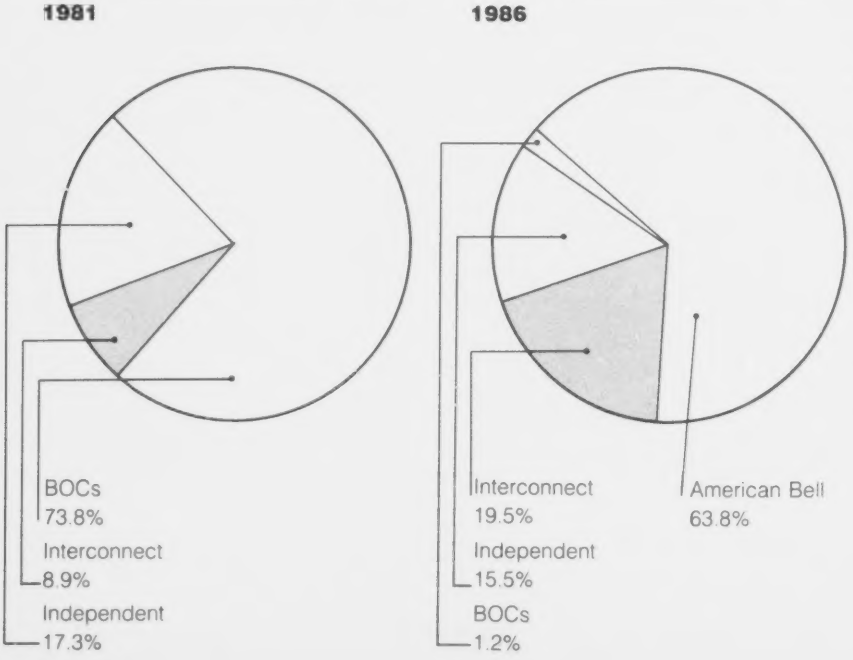
PBX MARKET SHARE: 1981/1986



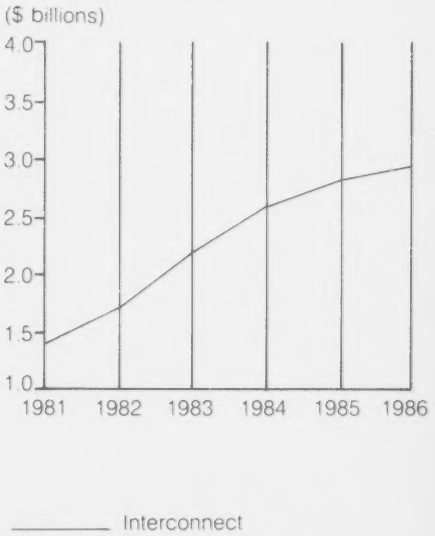
PBX-KEY MARKET GROWTH RATE: 1981-1986



KEY MARKET SHARE: 1981/1986



INTERCONNECT REVENUES: 1981-1986



BUSINESS INSTRUMENT INSTALLED BASE PROJECTIONS

BUSINESS TELEPHONE INSTRUMENT MARKET: 1981-1986

(000)

	1981	1982	1983	1984	1985	1986
BOCs	37,511	38,075	39,027	4,346	4,755	5,209
Growth	0.9%	1.5%	2.5%	(89%)	9.4%	9.5%
Share	69.1%	67.5%	64.9%	6.9%	7.1%	7.3%
AMERICAN BELL	*	*	636	36,247	37,008	37,785
Growth	*	*	*	*	2.1%	2.1%
Share	*	*	1.1%	57.2%	55.2%	53.3%
INDEPENDENT	10,269	10,526	10,947	11,385	11,840	12,314
Growth	2.1%	2.5%	4.0%	4.0%	4.0%	4.0%
Share	18.9%	18.7%	18.2%	17.9%	17.7%	17.4%
INTERCONNECT	6,505	7,798	9,494	11,421	13,462	15,571
Growth	19.8%	19.9%	21.7%	20.3%	17.9%	15.7%
Share	12.0%	13.8%	15.8%	18.0%	20.0%	22.0%
TOTAL	54,285	56,399	60,104	63,399	67,065	70,879
Growth	3.1%	3.9%	6.6%	5.5%	5.8%	5.7%

(Includes all telephones located on a business premises, including those associated with Centrex, PBX and Key systems, as well as single-line installations.)

Interconnect growth over the period shown averages just over 19 percent annually, down from an annual average of almost 28 percent from 1975 through 1980. This decrease is premised upon the effects of Bell's Migration Strategy, continued high interest rates through the period, potential sales of Bell's installed base during the transition preceding divestiture and the entry of American Bell as a strong competitor, starting in 1983. Interconnect market share, projected to increase from 12 percent in 1981 to 22 percent in 1986, is expected to level off thereafter.

The dramatic drop in BOC instruments and systems, and the corresponding jump for American Bell in 1984, reflects the transfer of AT&T's installed base (except Centrex) at the time of the divestiture. For the purposes of this study, it was assumed that the BOCs would begin divested operations on January 1, 1984 with a base of 3,772,000 Centrex instruments and would transfer 35,255,000 non-Centrex instruments to American Bell.

Growth for the independent telcos and for American Bell following divestiture is projected to follow historical patterns. Growth for the BOCs is projected conservatively on the assumption that it will take time for them to adjust to a deregulated environment.

SOURCE NATA Estimates

PBX-KEY INSTALLED BASE PROJECTIONS

PBX-KEY TELEPHONE INSTRUMENT MARKET: 1981-1986

(000)

	1981	1982	1983	1984	1985	1986
BOCs	31,085	31,800	31,933	4,346	4,755	5,209
Growth	1.9%	2.3%	0.4%	(86%)	9.4%	9.5%
Share	71.4%	69.6%	66.1%	8.4%	8.6%	8.9%
AMERICAN BELL	•	•	636	29,427	30,222	31,039
Growth	•	•	•	•	2.7%	2.7%
Share	•	•	1.3%	56.9%	54.8%	52.8%
INDEPENDENT	5,944	6,077	6,275	6,494	6,706	6,924
Growth	2.0%	2.2%	3.3%	3.5%	3.3%	3.3%
Share	13.7%	13.3%	13.0%	12.6%	12.2%	11.8%
INTERCONNECT	6,505	7,798	9,494	11,421	13,462	15,571
Growth	19.8%	19.9%	21.7%	20.3%	17.9%	15.7%
Share	14.9%	17.1%	19.6%	22.1%	24.4%	26.5%
TOTAL	43,534	45,675	48,338	51,688	55,145	58,743
Growth	4.3%	4.9%	5.8%	6.9%	6.7%	6.5%

(Includes all instruments connected to a Centrex, PBX or Key system.)

Patterns of growth and market share in the PBX-Key market closely resemble those for the total business market as a whole, with some adjustments to account for the exclusion of single-line business instruments. Overall growth of the market, as well as interconnect's share, will level off in the late 1980s.

American Bell will supply all new equipment for the Bell System in 1983. Following divestiture, the BOCs will be able to offer terminal equipment on an unregulated basis. The transfer of Bell's installed base is reflected in the jump in American Bell instruments and corresponding drop for the BOCs in 1984. It is assumed that upon divestiture, the BOCs will retain an installed base of 3,772,000 Centrex-associated instruments and will transfer 28,161,000 PBX-Key instruments to American Bell.

Both the BOCs and American Bell are expected to compete vigorously and successfully in the deregulated market.

 SOURCE: NATA Estimates

PBX INSTALLED BASE PROJECTIONS

PBX MARKET: 1981-1986						
INSTRUMENTS (000)						
	1981	**1982**	**1983**	**1984**	**1985**	**1986**
BOCs	18,350	18,772	18,866	4,150	4,524	4,931
Growth	1.7%	2.3%	0.5%	(78%)	9.0%	9.0%
Share	69.8%	67.9%	64.2%	13.2%	13.5%	13.8%
AMERICAN BELL	*	*	375	15,700	16,014	16,334
Growth	*	*	*	*	2.0%	2.0%
Share	*	*	1.3%	50.0%	47.7%	45.8%
INDEPENDENT	2,965	3,024	3,115	3,208	3,288	3,370
Growth	1.4%	2.0%	3.0%	3.0%	2.5%	2.5%
Share	11.3%	10.9%	10.6%	10.2%	9.8%	9.4%
INTERCONNECT	4,969	5,863	7,036	8,373	9,713	11,072
Growth	18.0%	18.0%	20.0%	19.0%	16.0%	14.0%
Share	18.9%	21.2%	23.9%	26.6%	29.0%	31.0%
TOTAL	26,284	27,659	29,392	31,431	33,539	35,707
Growth	4.4%	5.2%	6.3%	6.9%	6.7%	6.5%
SYSTEMS (000)						
BOCs	105	104	104	5	5	6
AMERICAN BELL	*	*	3	119	120	121
INDEPENDENT	35	35	36	37	38	39
INTERCONNECT	50	53	62	73	84	96
TOTAL	190	192	205	234	247	262

(Includes Centrex)

Average interconnect growth between 1981 and 1986 is projected at 17.5 percent annually, well above the total industry average for those years, but below interconnect's growth rates in the 1970s. Retention of Centrex, potential sales of Bell's installed base during the transition before divestiture and exploitation of existing inventories is expected to leave the BOCs in a relatively strong position in the PBX market. American Bell's 45 percent market share in 1986 is a conservative projection; if new product releases expected in the mid-1980s are successful, American Bell may retain substantially more of the market than is indicated.

The dramatic shift in installed base figures for the BOCs and American Bell reflects the transfer of the Bell installed base on January 1,1984. Specifically, it is assumed that 3,772,000 instruments, approximately 20 percent of total PBX instruments, are associated with Centrex systems and therefore will be retained by the BOCs after divestiture. It is assumed that slightly more than 15 million non-Centrex instruments will be transferred to American Bell.

While the BOCs are expected to make a determined effort to retain their Centrex customers, a significant number are expected to change over to favor privately owned PBX systems. This is reflected in the projected increase in interconnect PBX system size from 1982 through 1985.

SOURCE: NATA Estimates

KEY INSTALLED BASE PROJECTIONS

KEY MARKET: 1981–1986						
INSTRUMENTS (000)						
	1981	**1982**	**1983**	**1984**	**1985**	**1986**
BOCs	12,735	13,028	13,067	196	231	278
Growth	2.3%	2.3%	0.3%	(99%)	18%	20%
Share	73.8%	72.3%	69.0%	1.0%	1.0%	1.2%
AMERICAN BELL	*	*	261	13,727	14,208	14,705
Growth	*	*	*	*	3.5%	3.5%
Share	*	*	1.4%	67.8%	65.8%	63.8%
INDEPENDENT	2,979	3,053	3,160	3,286	3,418	3,554
Growth	2.5%	2.5%	3.5%	4.0%	4.0%	4.0%
Share	17.3%	17.0%	16.7%	16.2%	15.8%	15.5%
INTERCONNECT	1,536	1,935	2,458	3,048	3,749	4,499
Growth	26.0%	26.0%	27.0%	24.0%	23.0%	20.0%
Share	8.9%	10.7%	12.9%	15.0%	17.4%	19.5%
TOTAL	17,210	18,016	18,946	20,257	21,606	23,036
Growth	4.1%	4.4%	5.2%	6.9%	6.7%	6.6%
SYSTEMS (000)						
BOCs	2,547	2,606	2,613	39	46	56
AMERICAN BELL	*	*	52	2,745	2,842	2,941
INDEPENDENT	596	611	632	657	684	711
INTERCONNECT	128	161	223	277	341	409
TOTAL	3,271	3,378	3,520	3,718	3,913	4,117

(Includes "stand-alone" systems only, or an estimated 55 percent of the total Key market. Key systems behind PBX represent the rest of the Key market.)

Interconnect is expected to make its strongest gains in the Key market, reflecting increased competitiveness due to reduced cabling and installation costs associated with newer technology in equipment. Annual interconnect growth averages 24 percent for the period shown, and interconnect market share grows from 9 percent to 20 percent.

Average interconnect Key system size still is larger than the industry norm. However, interconnect vendors increasingly are moving into the small-systems market as well.

The dramatic drop in the BOCs' instruments and systems in 1984 results from the expected transfer of the entire installed base of Key equipment to American Bell at the time of divestiture. Once divested, the BOCs will be able to offer new equipment on an unregulated basis.

INTERCONNECT GROWTH AND REVENUE PROJECTIONS

INTERCONNECT INDUSTRY MARKET GROWTH AND REVENUES: 1981-1986

	Number Systems	Number Instruments (000)	New Sales ($ million)	Other Revenues ($ million)	Total Revenues ($ million)
1981					
PBX	7,250	834	$ 742		
KEY	42,000	374	336		
TOTAL	48,250	1,208	1,078	$ 287	$ 1,365
1982					
PBX	8,200	983	$ 875		
KEY	52,300	471	423		
TOTAL	60,500	1,454	1,298	$ 366	$ 1,664
1983					
PBX	10,700	1,290	$ 1,148		
KEY	68,600	617	555		
TOTAL	79,300	1,907	1,703	$ 509	$ 2,212
1984					
PBX	12,100	1,484	$ 1,321		
KEY	77,300	696	626		
TOTAL	89,400	2,180	1,947	$ 615	$ 2,562
1985					
PBX	11,900	1,514	$ 1,348		
KEY	92,000	827	744		
TOTAL	103,900	2,341	2,092	$ 697	$ 2,789
1986					
PBX	12,300	1,536	$ 1,367		
KEY	96,000	863	777		
TOTAL	108,300	2,399	2,144	$ 753	$ 2,897

(Figures show annual sales and service revenues for interconnect vendors. They are not cumulative. Key figures refer to "stand-alone" systems only. "OTHER" includes revenues from adds, moves, changes, maintenance, and sales of add-on equipment, such as SMDR equipment and data terminals.)

Growth rates for interconnect sales to end-users will be lower in the 1980s than they were in the 1970s, with the possibility of an even sharper decline in the late 1980s as the industry achieves a stable market share.

Despite the declining growth rate, it should be noted that the market effectively doubles in nearly all categories over the period shown. "Other" revenues show a gradual increase as a percent of total revenues, from 22 percent in 1981 to 26 percent in 1986, reflecting increased service and secondary sales revenues as the installed base grows.

Average PBX system size rises sharply between 1982 and 1985, reflecting the expected Centrex change out.

SOURCE: NATA Estimates

CRISIS IN THE PBX MARKET?

A FORECAST BY THE EASTERN MANAGEMENT GROUP

Editor's Note: In studies conducted by The Eastern Management Group, a number of conclusions have been reached which may be of major importance to the marketing and product-planning decisions interconnect manufacturers and distributors of PBX equipment must make. Therefore, NATA is presenting this forecast for the considered judgment of decision-makers.

Since the early 1970s, the PBX market has enjoyed robust sales. The Bell System's revenues have grown (while market share declined) and so too have the sales of interconnect firms.

Acceleration in the replacement market tempo, however, has concealed the fact that the PBX market of 1982 is much smaller than it was 10 years ago.

From 217,000 installed systems in 1971, the market has contracted to 145,600 pure PBX devices. The shortfall is made up of non-PBX devices that have displaced old switches:

- Centrex: 15,100 systems
- Hybrids: 31,600 systems
- Key products: 34,900 systems

The precise size of the PBX market is important, as is its composition, because different generic product types (i.e., pure PBX, Centrex) have unequal life expectancies. Since replacements account for the preponderance of new system installations, an understanding of the base is essential to planning and forecasting.

Pure PBX systems remain in place for 7 to 17 years, provided their life cycle is not disturbed. Bell did just this on its older-generation products, and its one-time base of almost 80,000 products will face extinction by the end of 1984, with a nominal 8,000 systems remaining.

Centrex may last longer than a normal PBX. But, neglect in the form of enhancements, hefty rate increases and AT&T's "pushing" of cross-elastic products is responsible for the ushering out of Centrex. Almost 50 percent of all Centrex users are talking replacement, and the BOCs which inherit the product may be powerless to halt the erosion. Centrex systems installed today, numbering 15,100, have a remaining life cycle of 4 to 7 years unless remedial action is taken.

The Eastern Management Group believes hybrids are a stopgap measure. Providing PBX functionality with a Key system at the core, these devices are seen as being viable for no longer than it takes to reduce to acceptable levels the PBX price per line for an average 25-line system. Few such hybrids are expected to be sold after 1987. Today their average life expectancy is 10 to 17 years.

Since switch replacement is responsible for most PBX sales (other minor contributions being real business establishment growth, installs due to moves, installs due to technology and installs due to policy), The Eastern Management Group reports that the inventory of older-generation PBX products is being exhausted. Centrex replacement cannot take up all the slack, and several market windows will begin to narrow commencing in 1985. Most vulnerable is the 100-to-400 line market, which will decline by 29 percent in annual line shipments from year end 1982 to year end 1985. The Eastern Management Group believes recovery will occur, but at different times for different line-size switches, vacillating between 1987 and 1988 within this 100-to-400 line group.

Glamour markets through 1992 are projected to be in the under-100 line and over-1,000 line segments. Conservative projections by The Eastern Management Group put the sub-100 line market size at $1.25 billion in 1992, up from $400 million today while the over-1,000 line market leaps 138 percent to $2.1 billion in 10 years.

As the decade unfolds, third-generation PBX sales will abound. But, success of the technology may have more to do with availability than demand for third-generation features. If few suppliers offer second-generation PBXs, replacement technologies may win by default.

Few "advanced features" offer users sufficient incentive to fuel a PBX upgrade. With this capability are LCR, SMDR and Call Management, all available on second-generation products. Lacking such power, except within niche markets, are third-generation regulars such as X.25 interfacing; store and forward voice; speed, code and protocol conversion; electronic mail; LAN interfacing; traffic modeling; even digital switching and data transmission above 9,600 bit/s.

When new PBXs are acquired, decisions are based on more than price. To the large user (over 300 lines), system reliability is the key consideration. Then comes service. Price ranks forth. Of little value to users are some of the more expensive selling services offered "gratis" to prospects by some manufacturers: new system design studies and free training for life. Even product technology is a low priority, which helps to explain the wide use of Centrex systems by Fortune 500 companies.

The industry prognosis for the next decade is guarded. As market segments approach saturation within the next 3 to 5 years, some casualties

SOURCE: The Eastern Management Group

are expected. Most vulnerable will be manufacturers who do not understand that older-generation Bell PBXs are a depleting resource, as well as companies who do not recognize that the preponderance of sales in recent years have been replacements for products other than the well-entrenched Dimensions, CBXs and SL-1s.

Should the BOCs reverse the forecasted Centrex erosion, market opportunities will narrow more rapidly.

Beyond the forecast period's midpoint, recovery will occur. Industry growth will be linear unless one company, or the economy, destabilizes the balance.

PBX Market Data: 1982-1986

Under normal business conditions, the PBX market routinely displays strong growth and offers substantial sales opportunities to the more than 20 manufacturers and 2,300 interconnects who participate in the industry. Two factors are responsible. First, businesses routinely churn their PBX system in favor of a competing technology each 7 to 17 years. The precise frequency of turnover depends on system size, with serving vehicles over 1,000 lines being displaced most often. The result is a perpetual demand for new PBXs that alters with fluctuations in the GNP, but only moderately. Second, PBX business telephone instrument growth increases by a fairly consistent 4.5 to 5.5 percent annual rate, which is divided between a one percent growth in the installed base of PBXs and from 3.5 to 4.5 percent real station growth in systems in service. If nothing upsets the status quo, a healthy market is almost always assured.

SOURCE: The Eastern Management Group

Since 1979, The Eastern Management Group has been monitoring the behavior of the PBX market. Since that time, two abnormal events have been witnessed, both of which are accelerating the replacement schedules of in-place PBXs. One is a near-term, though temporary increase in the demand for PBXs. The other is premature displacement, which means that the reservoir of mid-1980s PBX purchasers is being diminished. The market will contract for a short period, but in some line sizes the depression will be severe.

The Eastern Management Group's 1982-1986 PBX forecast traces, by line size, the inward and outward movement of PBXs in six categories which, when aggregated, represent the entire U.S. market. The distinct components are: (a) PBXs that replace any PBX not affected by the Bell System's installed base Migration Strategy; (b) PBXs that replace older-generation Bell System PBXs that have been affected by the company's installed base Migration Strategy; (c) PBXs that replace Centrex; (d) PBXs that replace hybrid offerings (i.e., WECo's Horizon); (e) PBXs that replace Key systems; and (f) PBXs that represent a net gain in the installed base.

PBXs Replacing PBXs: Those not affected by AT&T's Migration Strategy

If AT&T had not increased the tariff rates on much of its older-generation equipment, all PBXs as well as Centrex systems would face the same replacement schedules, varying only by system line size. For PBXs not affected by AT&T's Migration Strategy, the replacement interval is 17 years for systems under 100 lines, 10 to 14 years for devices from 101 to 300 lines, from 7 to 8.5 years on systems above 300 lines. This data, captured from two Eastern Management Group studies of 1,500 users, yields a guaranteed market for 6,000 PBX sales annually during the forecast period 1982-1986.

PBXs Replacing PBXs: Those affected by AT&T's Migration Strategy

In 1979, AT&T developed a plan that would rapidly rid the embedded base of most older-generation products. Calling for rate increases of up to 70 percent on several obsolete products, the intent of the program was to prematurely retire large numbers of older-generation PBXs.

AT&T's Migration Strategy is meeting its intended objective. From an installed base of some 72,000 older PBXs in 1979, the quantity shrank to 40,000 by year end 1981. In states where Migration tariffs have gone into effect, 90 percent of the impacted PBXs were jettisoned by customers within 36 months. Displacement is evenly distributed at 30 pecent a year.

Of the remaining 40,000 older-generation products, 32,000 are believed to be displaceable. Based upon the findings of Migration analysis to date, an estimated 10,000 to 11,000 such products will be retired annually until year end 1984. Once gone, however, none will be replaced again during the forecast period, depressing the total 1985 PBX market by approximately 50 percent of the PBX opportunities converted into sales in 1982. None of these 10,000 to 11,000 systems will appear on the market again before the 1990s.

PBXs Replacing Centrex

There are 15,100 Centrex systems in the U.S. Of them, 1,100 are in independent telephone company territory. The remainder are in the Bell System. In early 1981, The Eastern Management Group conducted a study of Centrex users, and found that one-third were anticipating the

replacement of the service by a more modern PBX. Interviewed again in June 1982, the number of Centrex users with plans to replace the product had swollen to 46 percent. The trend away from Centrex appears to be a grassroots movement. Two factors are responsible. First, AT&T has left the system virtually "feature-free" in comparison to second- and third-generation PBX offerings. Second, too little has been done to tame Centrex pricing, which, according to users, is forever inching upward.

Since the AT&T antitrust settlement, it is logical to assume that the Bell Operating Companies will relish the opportunity to save Centrex. Undoubtedly, product enhancements can be expected, and maybe lower Centrex rates are on the horizon if tariffs can squeeze past the state regulators. However, the real problem may be inertia. So much momentum is building to replace Centrex, that by the time the BOCs have the authority to take action, they may be incapable of stemming the erosion. The Eastern Management Group believes the Centrex base will decline to 1,500 systems, with users replacing Centrex service according to the following schedule: systems under 100 lines, 14 percent annual displacement; from 101 to 300 lines, 15 to 17 percent annual displacement; from 301 to 500 lines, 18 to 20 percent displacement; and above 500 lines, 22 to 25 percent annual displacement.

The impact of the depletion of the Centrex base is positive for the interconnect industry in the short term. It offers up 2,400 to 2,500 systems for replacement in 1982, and continues to do so each year through 1985 and 1986, a welcome windfall following the end of the "displaceable older-generation PBX" era.

If the BOCs are successful in their effort to defend the Centrex base against erosion, the overall market opportunity from 1982 to 1986 will be undermined by 2,400 to 2,500 systems annually.

PBX Replacing Hybrids

If AT&T finds a suitable PBX replacement for its hybrid Horizon telephone systems, and if PBX rates for small, under 50-line systems decline as expected, much of the hybrid marketplace could deteriorate. The Eastern Management Group believes that, based upon user interviews, hybrid longevity extends to 17 years for all devices except those installed under AT&T's Variable Term Payment Plan (VTPP) where the life expectancy is 10 years. Users view the renewal of a VTPP contract as less favorable than installing a suitable replacement.

Although the replacement of hybrids by PBXs is nominal in 1982, estimated to amount to no more than 150 sales, The Eastern Management Group believes the volume will increase. By 1986, over 2,000 PBXs will be shipped annually to replace hybrid offerings.

PBXs Replacing Key Systems

Just as Key systems replaced older PBXs, such as the WECo. 507, 555 and 755 during the 1970s, the opposite will occur in the 1980s. In 1982, it is believed that some 2,000 PBXs will be installed as replacement offerings for Key systems. By 1986, the number will grow to 7,000 sales annually. Beyond the study period, the numbers grow unabated. It is the shipment of increasingly larger quantities of Key system replacements that single-handedly thwarts a near collapse of the under-100 line market following the depletion of AT&T's base of older-generation PBXs, collectively averaging 79 lines each.

Net Gain PBXs

At year end 1981, the installed base of pure PBXs in the U.S. was 145,600. Of this figure, Eastern Management Group research shows that AT&T's share was 80,000 systems, while the independent telephone companies and the interconnect industry each accounted for in excess of 30,000 PBXs. With a normal growth in the base of 1 percent annually, an added 1,450 to 1,500 systems will be sold annually to compensate for real business establishment growth during the study period.

Total Market Sizing

The collective impact of PBX shipments/installs into the six market categories previously discussed portrays a PBX market environment where 20,000 systems will be installed in 1982. The number grows to 21,300 in 1983, 22,500 in 1984, and then drops to 16 800 in 1985 due to the elimination of displaceable older-generation PBX products. In 1986, the market shows some recovery, with 18,500 systems being installed.

An assessment of pure line shipments more accurately depicts market behvior. From sales of 3.2 million lines in 1982, the market absorbs 3.5 million lines in 1983 and another 4 million in 1984 before market contraction. The 1985 decline is slight, down to only 3.9 million lines. However, The Eastern Management Group believes that 1986 may be a bad year. Shipments could stop at 2.9 million lines, a reduction of 26 percent. If this occurs, the industry could experience some attrition as well as the arrival of another wave of new competitors interested in capitalizing on a makret upturn commencing in 1988.

SOURCE: The Eastern Management Group

DATA BASE

CARRIER TELEPHONE INSTRUMENTS

TOTAL CARRIER TELEPHONE INSTRUMENTS DECEMBER 31, 1981

Year	Instruments
1981	181,891,596
1980	180,424,023
1979	175,535,112
1978	169,026,948
1977	162,072,146
1976	155,173,288
1975	149,007,803
1974	143,971,452
1973	138,288,389
1972	131,602,500
1971	125,140,800
1970	120,221,000
1969	115,200,700
1968	109,255,600
1967	103,751,900
1966	98,785,600
1965	93,658,800
1964	88,787,400
1963	84,450,300
1962	80,971,700
1961	77,425,400
1960	74,341,100
1883	123,600

Figures show all telephones (business and residential) supplied by AT&T and Independent carriers as reported to the FCC. The average annual increase in carrier telephone instruments equalled 4.1 percent between 1970 and 1980, with a sharp decline to 0.8 percent in 1981. Normal growth patterns are expected to reassert themselves as the economy recovers from the present downturn.

SOURCE: FCC Statistics

CARRIER TELEPHONE DEVELOPMENT BY STATES
DECEMBER 31, 1981

DISTRIBUTION OF TELEPHONES

State	Total Number of Telephones	By Ownership		By Type of Service		Resident Population	Total Telephones Per 100 Population	% Households With Telephone Service
		Bell[1]	Independent	Residence	Business			
Alabama	2,640,727	2,178,317	462,410	2,013,822	626,905	3,962,000	66.65	87
Alaska	325,000(E)	0	325,000(E)	208,000(E)	117,000(E)	412,000	78.88(E)	90(E)
Arizona	2,194,598	2,093,064	101,494	1,630,688	563,870	2,863,000	76.65	95
Arkansas	1,461,555	1,016,285	445,270	1,114,927	346,628	2,328,000	62.78	85
California	21,163,281	16,412,316	4,750,965	14,994,878	6,168,403	24,403,000	86.72	100
Colorado	2,560,912	2,515,057	45,855	1,823,533	737,379	3,014,000	84.97	97
Connecticut	2,702,082	2,680,875	21,207	1,999,582	702,500	3,133,000	86.25	103
Delaware	540,123	540,123	0	391,222	148,901	601,000	89.87	100
District of Columbia	1,094,898	1,094,898	0	511,118	583,780	631,000	173.52	103
Florida	8,679,284	5,573,967	3,105,317	6,504,473	2,174,811	10,143,000	85.57	98
Georgia	4,339,135	3,710,640	628,495	3,214,403	1,124,732	5,586,000	77.68	88
Hawaii	721,926	0	721,926	470,475	251,451	989,000	73.00	98
Idaho	717,652	557,090	160,562	529,417	188,235	985,000	72.86	92
Illinois	10,275,846	8,481,275	1,794,571	7,700,284	2,575,562	11,438,000	89.84	99
Indiana	4,117,473	2,623,930	1,493,543	3,140,906	976,567	5,501,000	74.85	92
Iowa	2,297,443	1,555,380	742,063	1,736,326	561,117	2,939,000	78.17	95
Kansas	2,008,332	1,666,045	342,287	1,521,149	487,183	2,407,000	83.44	96
Kentucky	2,337,658	1,631,714	705,944	1,775,985	561,673	3,702,000	63.15	86
Louisiana	3,091,845	2,891,464	200,381	2,327,514	764,331	4,294,000	72.00	93
Maine	815,587	713,796	101,791	629,480	186,107	1,144,000	71.29	98
Maryland	3,648,571	3,643,450	5,121	2,708,286	940,285	4,272,000	85.41	99
Massachusetts	4,654,749	4,650,585	4,164	3,384,834	1,269,915	5,758,000	80.84	101
Michigan	7,253,301	6,282,524	970,777	5,526,140	1,727,161	9,295,000	78.03	98
Minnesota	3,256,597	2,540,454	716,143	2,394,889	861,708	4,143,000	77.52	99
Mississippi	1,612,513	1,529,477	83,036	1,246,448	366,065	2,568,000	62.79	82
Missouri	2,878,677	3,070,088	808,589	2,901,274	977,403	4,985,000	77.81	94
Montana	630,733	516,140	114,593	461,943	168,790	805,000	78.35	95
Nebraska	1,344,341	760,058	584,283	998,285	346,056	1,582,000	84.98	100
Nevada	756,148	264,373	491,775	516,269	239,879	870,000	86.91	84
New Hampshire	727,611	688,243	39,368	545,041	182,570	955,000	76.19	99
New Jersey	6,797,352	6,631,108	166,244	5,026,272	1,771,080	7,413,000	91.70	108
New Mexico	896,584	764,830	131,754	625,661	270,923	1,355,000	66.17	86
New York	12,749,979	11,621,516	1,128,463	9,370,000	3,379,979	17,432,000	73.14	97
North Carolina	4,325,419	2,285,163	2,040,256	3,261,481	1,063,938	5,968,000	72.48	91
North Dakota	541,479	388,907	152,572	396,208	145,271	665,000	88.17	98
Ohio	8,085,385	6,031,355	2,054,030	6,179,172	1,906,213	10,786,000	74.96	94
Oklahoma	2,550,326	2,176,066	374,260	1,869,598	680,728	3,105,000	82.14	96
Oregon	2,034,403	1,441,155	593,248	1,421,853	612,550	2,757,000	73.79	86
Pennsylvania	9,894,620	7,951,267	1,943,353	7,509,655	2,384,965	11,831,000	83.63	99
Rhode Island	730,133	730,133	0	551,639	178,494	946,000	77.18	98
South Carolina	2,131,681	1,504,875	626,806	1,590,516	541,165	3,190,000	66.82	86
South Dakota	529,264	411,591	117,673	390,112	139,152	692,000	76.48	92
Tennessee	3,247,787	2,697,227	550,560	2,480,683	767,104	4,699,000	69.12	88
Texas	11,690,638	9,410,858	2,279,780	8,367,781	3,322,857	14,805,000	78.96	95
Utah	1,094,279	1,051,664	42,615	822,818	271,461	1,544,000	70.87	93
Vermont	377,716	327,899	49,817	278,625	99,091	524,000	72.08	101
Virginia	3,956,259	3,133,601	822,658	2,923,675	1,032,584	5,468,000	72.35	91
Washington	3,341,681	2,395,408	946,273	2,335,422	1,006,259	4,347,000	76.87	90
West Virginia	1,137,637	975,073	162,564	869,808	267,829	1,980,000	57.46	85
Wisconsin	3,501,055	2,360,286	1,140,769	2,622,358	878,697	4,774,000	73.34	98
Wyoming	429,361	403,175	26,186	296,592	132,769	519,000	82.73	89
Total	181,891,596	146,574,785	35,316,811	134,111,520	47,780,076	230,508,000	78.91	96

[1]American Telephone and Telegraph Company and its Principal Telephone Subsidiaries. Excludes 491,741 private line telephones.

(E) Estimate

SOURCE: American Telephone and Telegraph Company

CARRIER TELEPHONES BY LARGE EXCHANGES

CARRIER TELEPHONE DEVELOPMENT BY LARGE EXCHANGE AREA DECEMBER 31, 1980

Exchange or Zone Area	Code*	Telephone Instruments			Population (000)	Telephones Per 100 Pop.	Total Main Telephones
		Residence	Business	Total			
Abilene, Texas	A	63,352	27,545	90,897	106	85.4	44,600
Akron, Ohio	A	265,977	85,437	351,414	455	77.3	174,793
Albany, Georgia	A	62,385	21,500	83,885	108	77.7	38,866
Albany, New York	A	94,850	73,862	168,712	194	86.9	75,931
Albuquerque, New Mexico	A	231,430	96,945	328,375	495	66.3	171,820
Alexandria, Louisiana	A	59,974	21,037	81,011	115	70.3	40,691
Alexandria, Virginia	A	262,586	157,341	419,927	440	95.4	183,287
Alhambra, California	A	129,224	41,594	170,818	207	82.5	94,699
Allentown, Pennsylvania	A	112,708	43,024	155,732	160	97.3	73,731
Altoona, Pennsylvania	A	47,948	13,104	61,052	76	80.9	31,522
Amarillo, Texas	A	107,646	41,343	148,989	152	98.1	68,856
Anaheim, California	C	165,094	72,578	237,672	277	85.8	117,754
Anchorage, Alaska	A	NA	NA	149,548	204	73.3	82,487
Anderson, Indiana	A	52,089	15,050	67,139	91	73.8	31,747
Ann Arbor, Michigan	A	80,192	55,807	135,999	131	103.8	56,557
Appleton, Wisconsin	A	49,553	19,145	68,698	100	68.6	34,642
Arlington, Massachusetts	A	32,156	4,598	36,754	63	58.0	21,965
Arlington, Texas	C	94,766	26,594	121,360	152	80.0	60,074
Arlington Heights, Illinois	C	89,759	25,608	115,367	130	89.0	51,094
Arvada, Colorado			(Included in Denver, Colorado)				
Asheville, North Carolina	A	55,535	25,207	80,742	97	83.1	39,365
Athens, Georgia	A	46,485	24,789	71,274	79	89.9	32,145
Atlanta, Georgia	A	616,147	338,654	954,801	100	95.5	403,113
Augusta, Georgia	A	117,059	49,651	166,710	221	75.4	74,937
Aurora, Colorado			(Included in Denver, Colorado)				
Aurora, Illinois	C	78,856	24,358	103,214	122	84.8	45,191
Austin, Texas	A	295,348	131,814	427,162	465	91.9	204,708
Bakersfield, California	A	154,967	51,705	206,672	281	73.5	108,143
Baltimore, Maryland	A	1,119,314	374,372	1,493,686	1,681	88.9	826,069
Baton Rouge, Louisiana	A	231,511	92,051	323,562	388	83.3	149,514
Bayonne, New Jersey	B	42,069	9,972	52,041	65	80.1	29,324
Baytown, Texas	A	NA	NA	44,069	57	77.4	23,233
Beaumont, Texas	A	75,173	31,359	106,532	133	80.1	53,747
Bellevue, Washington	A	70,827	23,096	93,923	100	94.1	49,685
Berkeley, California			(Included in East Bay Exchange)				
Berwyn, Illinois	A	39,654	6,498	46,152	50	91.4	25,368
Bethlehem, Pennsylvania	A	65,757	23,525	89,282	92	97.1	41,984
Billings, Montana	A	61,850	25,665	87,515	98	88.9	42,532
Biloxi, Mississippi	A	30,678	11,014	41,692	70	59.4	22,248
Binghamton, New York	A	59,710	28,238	87,948	117	75.0	47,744
Birmingham, Alabama	A	346,956	144,801	491,757	569	86.4	225,713
Bloomington, Indiana	A	39,093	23,985	63,078	95	66.7	27,680

*Extent of Exchange (see page 36)

NOTE: THESE AREAS GENERALLY ARE LARGER THAN THE CORPORATE AREAS OF THE CITIES THEY SERVE

CARRIER TELEPHONE DEVELOPMENT BY LARGE EXCHANGE AREA
DECEMBER 31, 1980

Exchange or Zone Area	Code*	Telephone Instruments			Population (000)	Telephones Per 100 Pop.	Total Main Telephones
		Residence	Business	Total			
Bloomington, Minnesota		(Included in Minneapolis—St. Paul)					
Boise, Idaho	A	96,528	43,849	140,377	160	87.8	64,669
Boston, Massachusetts	C	297,304	247,185	544,489	646	84.4	250,817
Boulder, Colorado		(Included in Denver, Colorado)					
Bradenton, Florida	A	77,276	19,137	96,413	109	88.4	62,737
Bridgeport, Connecticut	A	133,178	55,902	189,080	228	82.8	93,500
Bristol, Connecticut	A	39,754	7,379	47,133	70	67.5	27,013
Brockton, Massachusetts	A	61,155	17,710	78,865	111	71.1	42,741
Brookline, Massachusetts	C	57,145	31,434	88,579	91	97.4	42,402
Brownsville, Texas	A	37,283	15,302	52,585	90	58.4	28,174
Buena Park, California	C	39,311	17,493	56,804	76	74.7	26,825
Buffalo, New York	A	295,456	100,309	395,765	687	57.6	240,964
Burbank, California	A	77,856	54,761	132,617	118	112.4	62,901
Cambridge, Massachusetts	A	56,649	53,539	110,188	123	89.4	50,033
Camden, New Jersey	A	53,075	23,119	76,194	88	86.9	31,588
Canton, Ohio	A	101,207	28,669	129,876	177	73.3	67,753
Casper, Wyoming	A	47,963	23,176	71,139	72	98.4	33,819
Cedar Rapids, Iowa	A	99,000	35,300	134,300	146	92.2	61,900
Champaign, Illinois	A	78,464	39,592	118,056	111	106.4	50,866
Charleston, South Carolina	A	155,568	65,042	220,610	288	76.6	97,841
Charleston, West Virginia	A	145,113	65,648	210,761	270	78.2	113,120
Charlotte, North Carolina	C	272,692	124,506	397,198	365	108.8	174,036
Chattanooga, Tennessee	A	194,790	64,429	259,219	345	75.2	127,182
Chesapeake, Virginia		(Included in Norfolk, Virginia)					
Chicago, Illinois	C	1,902,525	886,968	2,789,493	3,005	92.8	1,308,378
Chicopee, Massachusetts	C	18,138	4,494	22,632	45	50.4	14,067
Chula Vista, California	C	104,482	19,496	123,978	171	72.5	68,800
Cicero, Illinois	A	39,798	13,037	52,835	53	100.6	26,059
Cincinnati, Ohio	A	566,510	222,329	788,839	864	91.3	361,862
Clearwater, Florida	A	188,193	54,380	242,573	276	87.9	155,026
Cleveland Heights, Ohio	A	667,052	268,910	935,962	1,110	84.3	440,679
Cleveland Hts, Ohio		(Included in Cleveland, Ohio)					
Clifton, New Jersey		(Included in Passaic, New Jersey)					
Colorado Springs, Colorado	A	174,724	68,389	243,113	316	77.0	119,099
Columbia, Missouri	A	NA	NA	80,209	98	81.6	39,565
Columbia, South Carolina	A	203,358	98,481	301,839	340	88.8	131,238
Columbus, Georgia	A	105,894	39,644	145,538	195	74.6	66,812
Columbus, Ohio	C	328,276	164,233	492,509	493	99.9	215,461
Compton, California	A	187,451	89,263	276,714	348	79.5	143,790
Concord, California	A	81,814	24,751	106,565	149	71.7	58,891
Corpus Christi, Texas	A	136,366	55,305	191,671	240	79.9	90,242
Costa Mesa, California		(Included in Newport Beach, California)					
Council Bluffs, Iowa	A	43,100	10,600	53,700	66	81.1	26,400

*Extent of Exchange (see page 36)

NOTE: THESE AREAS GENERALLY ARE LARGER THAN THE CORPORATE AREAS OF THE CITIES THEY SERVE

CARRIER TELEPHONES BY LARGE EXCHANGES

CARRIER TELEPHONE DEVELOPMENT BY LARGE EXCHANGE AREA DECEMBER 31, 1980

Exchange or Zone Area	Code*	Telephone Instruments			Population (000)	Telephones Per 100 Pop.	Total Main Telephones
		Residence	Business	Total			
Covina, California	A	264,641	73,248	337,889	418	80.8	164,885
Covington, Kentucky	A	105,762	21,004	126,766	192	66.1	68,214
Cranston, Rhode Island		(Included in Providence, Rhode Island)					
Dallas, Texas	C	750,964	230,408	981,372	1,137	86.3	461,092
Daly City, California		(Included in San Francisco, California)					
Danbury, Connecticut	A	62,578	23,931	86,509	93	93.2	42,672
Danville, Virginia	A	33,820	9,268	43,088	84	51.3	23,767
Davenport, Iowa	A	95,900	30,000	125,900	144	87.4	59,700
Dayton, Ohio	A	280,189	104,360	384,549	442	86.9	182,611
Daytona, Florida	A	98,293	35,304	133,597	176	76.1	72,883
Dearborn, Michigan		(Included in Detroit, Michigan)					
Dearborn Heights, Michigan		(Included in Detroit, Michigan)					
Decatur, Illinois	A	77,648	23,614	101,262	100	101.6	44,738
Denton, Texas	A	NA	NA	50,707	59	85.9	25,439
Denver, Colorado	A	1,008,135	423,173	1,431,308	1,598	89.6	711,274
Des Moines, Iowa	A	199,000	92,500	291,500	317	92.0	123,700
Des Plaines, Illinois	A	57,622	40,061	97,683	117	83.4	48,399
Detroit, Michigan	A	1,127,678	398,564	1,526,242	1,486	102.7	707,021
Downey, California	A	214,318	82,125	296,443	356	83.3	143,293
Dubuque, Iowa	A	42,600	17,000	59,600	79	75.9	29,900
Duluth, Minnesota	A	72,300	23,900	96,200	124	77.8	50,600
Durham, North Carolina	A	88,301	40,932	129,233	155	83.6	71,190
East Bay Exchange, California	A	412,764	202,074	614,838	670	91.7	331,696
East Hartford, Connecticut		(Included in Hartford Exchange)					
East Lansing, Michigan		(Included in Lansing, Michigan)					
East Orange, New Jersey		(Included in Orange Exchange)					
East St. Louis, Illinois	A	55,748	11,293	67,041	101	66.1	29,218
Eau Claire, Wisconsin	A	39,557	17,058	56,615	71	80.2	27,860
El Cajon, California	C	124,575	25,025	149,600	183	81.7	81,651
El Monte, California	A	49,761	24,933	74,694	101	74.0	41,203
El Paso, Texas	A	209,205	76,622	285,827	437	65.5	148,287
Elgin, Illinois	A	58,036	16,348	74,384	73	101.6	33,744
Elizabeth, New Jersey	A	70,921	29,270	100,191	116	86.4	50,604
Elyria, Ohio	A	44,602	12,509	57,111	61	94.0	35,298
Enid, Oklahoma	A	35,118	14,619	49,737	50	98.8	24,018
Erie, Pennsylvania	A	105,780	43,356	149,136	185	80.6	80,402
Escondido, California	A	74,350	21,195	95,545	93	102.7	52,361
Euclid, Ohio		(Included in Cleveland, Ohio)					
Eugene-Springfield, Oregon	A	118,619	40,826	159,445	247	64.7	101,398
Evanston, Illinois	B	62,380	25,602	87,982	72	121.9	38,301
Evansville, Indiana	A	97,809	37,096	134,905	155	87.0	63,675
Everett, Washington	A	56,617	19,186	75,803	96	79.0	45,482
Fairbanks, Alaska	A	NA	NA	38,889	54	72.0	15,283

*Extent of Exchange (see page 36)

NOTE: THESE AREAS GENERALLY ARE LARGER THAN THE CORPORATE AREAS OF THE CITIES THEY SERVE

CARRIER TELEPHONE DEVELOPMENT BY LARGE EXCHANGE AREA DECEMBER 31, 1980

Exchange or Zone Area	Code*	Telephone Instruments			Population (000)	Telephones Per 100 Pop.	Total Main Telephones
		Residence	Business	Total			
Fairfield, California	A	42,644	14,896	57,540	83	69.1	28,083
Fairfield, Connecticut	C	26,760	6,187	32,947	35	93.9	15,831
Fall River, Massachusetts	A	69,188	16,675	85,863	121	70.7	50,970
Fargo, North Dakota— Moorehead, Minnesota	A	78,200	34,800	113,000	124	91.5	49,800
Farmington, Michigan	C	55,514	16,186	71,700	93	77.4	36,170
Farmington Hills, Michigan		(Included in Farmington, Michigan)					
Fayetteville, North Carolina	A	114,082	44,705	158,787	247	64.2	75,726
Flint, Michigan	A	182,053	50,413	232,466	242	95.9	110,665
Florissant, Missouri	C	57,966	6,971	64,937	103	63.1	34,020
Ft. Collins, Colorado	A	52,760	21,081	73,841	102	72.3	38,440
Ft. Lauderdale, Florida	A	346,465	117,188	463,653	453	102.3	239,821
Ft. Myers, Florida	A	56,297	28,874	85,171	99	86.5	49,870
Fort Smith, Arkansas	A	45,352	19,398	64,750	84	76.9	34,462
Fort Wayne, Indiana	A	127,599	55,629	183,228	254	72.3	92,277
Fort Worth, Texas	C	255,158	113,092	368,250	396	93.1	171,888
Fountain Valley, California		(Included in Huntington Beach, California)					
Framingham, Massachusetts	A	49,163	18,930	68,093	77	88.6	34,871
Fremont City, California	A	120,923	27,074	147,997	225	65.8	82,268
Fresno, California	A	216,950	78,187	295,137	370	79.9	152,669
Fullerton, California	C	64,993	40,685	105,678	89	118.7	45,543
Gadsden, Alabama	A	46,310	11,541	57,851	85	68.0	30,892
Gainesville, Florida	A	69,197	36,400	105,597	122	86.8	49,595
Galveston, Texas	A	38,575	20,387	58,962	74	79.3	29,123
Garden Grove, California	C	74,009	16,621	90,630	119	76.2	49,933
Garland, Texas	C	NA	NA	101,296	127	79.9	50,325
Gary, Indiana	A	78,192	18,010	96,202	184	52.4	36,526
Gastonia, North Carolina	A	54,921	15,920	70,841	87	81.4	34,033
Glendale, Arizona		(Included in Phoenix, Arizona)					
Glendale, California	A	78,217	34,721	112,938	109	103.6	61,437
Grand Prairie, Texas	C	46,139	26,080	72,219	78	92.6	30,324
Grand Rapids, Michigan	A	245,280	78,700	323,980	378	85.6	160,676
Great Falls, Montana	A	44,107	18,335	62,442	75	83.6	30,367
Greeley, Colorado	A	39,712	16,305	56,017	72	77.8	28,032
Green Bay, Wisconsin	A	74,697	29,390	104,087	148	70.4	53,835
Greensboro, North Carolina	A	154,560	63,245	217,805	223	97.9	95,297
Greenville, South Carolina	A	136,785	53,715	190,500	247	77.1	89,369
Gulfport, Mississippi	A	46,236	15,869	62,105	97	64.0	31,441
Haddonfield, New Jersey	C	54,688	16,879	71,567	60	118.3	32,707
Hamden, Connecticut		(Included in New Haven, Connecticut)					
Hamilton, Ohio	A	73,769	19,926	93,695	114	82.4	47,885
Hammond, Indiana	A	62,925	13,996	76,921	107	72.0	35,064

*Extent of Exchange (see page 36)

NOTE: THESE AREAS GENERALLY ARE LARGER THAN THE CORPORATE AREAS OF THE CITIES THEY SERVE

CARRIER TELEPHONES BY LARGE EXCHANGES

CARRIER TELEPHONE DEVELOPMENT BY LARGE EXCHANGE AREA DECEMBER 31, 1980

Exchange or Zone Area	Code*	Telephone Instruments			Population (000)	Telephones Per 100 Pop.	Total Main Telephones
		Residence	Business	Total			
Hampton, Virginia		(Included in Newport News, Virginia)					
Harrisburg, Pennsylvania	A	147,671	71,559	219,230	186	118.1	93,145
Hartford, Connecticut	A	208,252	129,750	338,002	345	98.0	144,795
Hawthorne, California	A	47,968	44,178	92,146	87	105.9	39,607
Hayward, California	A	117,161	40,998	158,159	222	71.2	88,954
Hialeah, Florida		(Included in Miami, Florida)					
High Point, North Carolina	A	60,168	22,747	82,915	110	75.3	45,330
Hollywood, Florida	A	209,688	44,107	253,795	293	86.5	136,391
Honolulu, Hawaii	A	NA	NA	398,105	369	107.9	215,291
Houma, Louisiana	A	41,015	15,328	56,343	86	65.2	29,246
Houston, Texas	A	925,235	589,581	1,514,816	1,780	85.1	710,742
Huntington, West Virginia	A	72,203	24,272	96,475	153	63.1	55,272
Huntington Beach, California	C	135,240	24,983	160,223	170	94.2	81,968
Huntsville, Alabama	A	101,544	52,608	154,152	192	80.1	65,360
Independence, Missouri	C	54,413	10,790	65,203	82	79.1	35,536
Indianapolis, Indiana	C	479,116	196,820	675,936	761	88.8	277,430
Inglewood, California	A	87,954	58,961	146,915	140	104.9	70,932
Irvine, California		(Included in Newport Beach, Calif.)					
Irving, Texas	A	NA	NA	93,596	124	75.5	47,466
Jackson, Mississippi	A	153,665	73,508	227,173	279	81.3	100,356
Jacksonville, Florida	D	321,814	126,715	448,529	565	79.4	205,422
Janesville, Wisconsin	A	35,221	10,348	45,569	61	75.3	24,203
Jersey City, New Jersey	A	142,772	48,163	190,935	266	71.9	102,973
Joliet, Illinois	A	81,170	24,467	105,637	134	78.9	47,494
Kalamazoo, Michigan	A	116,651	47,261	163,912	176	93.0	75,114
Kansas City, Kansas	C	129,710	46,441	176,151	191	92.0	81,596
Kansas City, Missouri	C	196,976	147,624	344,600	288	119.5	135,866
Keansburg, New Jersey	C	18,863	1,870	20,733	36	57.3	12,800
Kenner, Louisiana	A	73,136	12,283	85,419	119	71.7	44,688
Kenosha, Wisconsin	A	53,540	16,374	69,914	94	74.2	36,376
Kettering, Ohio		(Included in Dayton, Ohio)					
Knoxville, Tennessee	A	163,476	70,361	233,837	299	78.2	116,537
La Mesa, California	C	111,348	19,770	131,118	172	76.2	72,560
Lafayette, Louisiana	A	72,899	34,358	107,257	118	90.8	54,771
Lake Charles, Louisiana	A	69,773	24,592	94,365	116	81.3	48,120
Lakeland, Florida	A	72,157	22,297	94,454	130	72.7	57,703
Lakewood, Colorado		(Included in Denver, Colorado)					
Lakewood, Ohio		(Included in Cleveland, Ohio)					
Lancaster, Pennsylvania	A	81,735	33,697	115,432	114	101.4	54,019
Lansing, Michigan	A	151,209	88,543	239,752	248	96.5	99,375
Laredo, Texas	A	37,528	17,100	54,628	99	55.2	28,279
Las Vegas, Nevada	A	299,909	122,811	422,720	366	115.5	183,415
Lawrence, Kansas	A	35,671	15,534	51,205	56	90.8	24,202

*Extent of Exchange (see page 36)

NOTE: THESE AREAS GENERALLY ARE LARGER THAN THE CORPORATE AREAS OF THE CITIES THEY SERVE

CARRIER TELEPHONE DEVELOPMENT BY LARGE EXCHANGE AREA
DECEMBER 31, 1980

Exchange or Zone Area	Code*	Telephone Instruments			Population (000)	Telephones Per 100 Pop.	Total Main Telephones
		Residence	Business	Total			
Lawrence, Massachusetts	A	62,627	23,181	85,808	127	67.5	48,228
Lawton, Oklahoma	A	50,447	14,015	64,462	112	57.3	33,648
Lexington, Kentucky	A	122,383	60,796	183,179	203	90.2	103,670
Lima, Ohio	A	40,247	20,529	60,776	95	63.9	34,273
Lincoln, Nebraska	A	110,500	58,900	169,400	193	87.8	78,200
Little Rock, Arkansas	A	198,123	84,057	282,180	290	97.4	138,465
Livonia, Michigan	A	94,396	28,641	123,037	166	74.0	61,115
Long Beach, California	C	277,638	109,743	387,381	443	87.4	211,834
Longview, Texas	A	55,135	20,425	75,560	102	74.0	37,583
Lorain, Ohio	B	42,642	10,826	53,468	85	63.0	34,917
Los Angeles, California	A	580,794	989,930	1,570,724	1,706	92.1	847,138
Louisville, Kentucky	A	443,073	146,021	589,094	686	85.9	289,999
Lowell, Massachusetts	A	84,628	26,735	111,363	174	64.1	60,350
Lubbock, Texas	A	120,657	53,453	174,110	191	91.0	76,282
Lynchburg, Virginia	A	64,736	23,053	87,789	119	73.6	45,209
Lynn, Massachusetts	A	59,618	20,221	79,839	109	73.0	42,667
Macon, Georgia	A	92,855	31,486	124,341	155	80.5	59,805
Madison, Wisconsin	A	126,936	75,174	202,110	210	96.2	95,406
Malden, Massachusetts	C	32,443	7,574	40,017	55	72.5	24,299
Manchester, New Hampshire	A	59,475	26,648	86,123	99	86.7	45,012
Mansfield, Ohio	A	45,771	19,715	65,486	119	55.2	37,314
Medford, Massachusetts	C	29,459	5,730	35,189	62	56.7	22,079
Memphis, Tennessee	A	488,919	156,488	645,407	808	79.9	311,649
Mercerville, New Jersey	C	44,596	9,958	54,554	50	109.9	28,929
Meriden, Connecticut	A	33,589	9,436	43,025	58	74.3	23,865
Meridian, Mississippi	A	36,269	11,879	48,148	59	82.2	24,625
Mesa, Arizona		(Included in Phoenix, Arizona)					
Metuchen, New Jersey	C	45,047	17,911	62,958	86	72.9	29,878
Miami, Florida	A	839,277	365,545	1,204,822	1,428	84.4	563,649
Miami Beach, Florida		(Included in Miami, Florida)					
Middletown, Ohio	A	35,915	11,202	47,117	67	69.9	24,405
Midland, Texas	C	58,035	29,155	87,190	81	107.8	37,149
Midwest City, Oklahoma		(Included in Oklahoma City, Oklahoma)					
Milford, Connecticut	A	33,409	9,512	42,921	55	77.6	22,401
Milton, Massachusetts	C	32,060	4,941	37,001	54	68.1	18,538
Milwaukee, Wisconsin	A	644,366	259,778	904,144	1,354	66.8	466,003
Minneapolis—St. Paul, Minnesota	A	1,223,800	483,000	1,706,800	1,922	88.8	799,300
Mobile, Alabama	A	199,331	60,564	259,895	360	72.2	130,925
Modesto, California	A	107,132	32,569	139,701	193	72.3	74,326
Monroe, Louisiana	A	75,816	26,784	102,600	136	75.4	50,529
Montebello, California	A	47,505	33,605	81,110	81	100.1	40,728
Montgomery, Alabama	A	122,986	45,608	168,594	192	87.9	80,497

*Extent of Exchange (see page 36)

NOTE: THESE AREAS GENERALLY ARE LARGER THAN THE CORPORATE AREAS OF THE CITIES THEY SERVE

CARRIER TELEPHONES BY LARGE EXCHANGES

CARRIER TELEPHONE DEVELOPMENT BY LARGE EXCHANGE AREA DECEMBER 31, 1980

Exchange or Zone Area	Code*	Telephone Instruments			Population (000)	Telephones Per 100 Pop.	Total Main Telephones
		Residence	Business	Total			
Mountain View, California	C	52,837	30,850	83,687	92	90.6	41,465
Mt. Prospect, Illinois		(Included in Arlington Heights, Illinois)					
Mt. Vernon, New York	A	99,782	17,888	117,670	159	74.2	69,962
Muncie, Indiana	A	57,485	23,506	80,991	107	75.5	37,760
Muskegon, Michigan	A	65,958	23,160	89,118	132	67.3	51,036
Napa, California	A	44,813	12,522	57,335	76	75.4	30,884
Nashua, New Hampshire	A	51,630	25,461	77,091	88	87.2	35,676
Nashville, Tennessee	A	307,949	123,563	431,512	510	84.6	203,855
National City, California	C	53,089	8,678	61,767	94	65.7	34,246
New Bedford, Massachusetts	A	77,802	20,575	98,377	148	66.7	58,536
New Britain, Connecticut	A	49,763	13,370	63,133	88	71.7	37,203
New Haven, Connecticut	A	201,218	84,485	285,703	316	90.5	134,046
New Iberia, Louisiana	A	28,785	8,552	37,337	54	69.8	20,222
New Orleans, Louisiana	A	580,275	218,555	798,830	994	80.4	400,604
New Rochelle, New York	D	49,932	10,448	60,380	71	85.4	34,525
New York, New York	B	3,971,440	1,836,705	5,808,145	7,067	82.1	3,207,274
Newark, New Jersey	A	223,636	118,062	341,698	416	82.0	154,340
Newport Beach, California	C	97,364	39,013	136,377	122	111.8	68,500
Newport News Metro Area, Virginia	C	164,635	47,323	211,958	325	65.2	111,622
Newton, Massachusetts	D	61,601	19,052	80,653	97	82.6	40,195
Niagara Falls, New York	A	44,401	16,495	60,896	98	62.4	35,486
Norfolk Metro Area, Virginia	C	381,853	117,947	499,800	726	68.8	255,101
Norman, Oklahoma		(Included in Oklahoma City, Oklahoma)					
North Little Rock, Arkansas		(Included in Little Rock, Arkansas)					
Norwalk, Connecticut	B	52,592	22,984	75,576	76	99.4	35,845
Oak Lawn, Illinois	A	111,752	20,875	132,627	179	74.2	65,246
Oak Park, Illinois	B	47,091	10,604	57,695	50	115.4	27,184
Oakland, California		(Included in East Bay Exchange)					
Oceanside, California	C	66,501	17,055	83,556	134	62.4	43,720
Odessa, Texas	A	72,798	27,978	100,776	104	96.8	46,555
Ogden, Utah	A	74,145	20,664	94,809	152	62.5	47,856
Oklahoma City, Oklahoma	C	500,850	204,157	705,007	776	90.9	331,271
Omaha, Nebraska	A	387,700	128,700	516,400	560	92.1	231,000
Ontario, California	A	121,922	29,772	151,694	154	98.5	76,742
Orange, California	C	99,424	40,321	139,745	155	90.2	66,771
Orange, New Jersey	A	110,920	31,065	141,985	147	96.6	69,611
Orlando, Florida	A	197,398	93,760	291,158	367	79.4	140,337
Overland Park, Kansas	C	118,367	29,951	148,318	147	100.9	64,355
Owensboro, Kentucky	A	37,308	14,623	51,931	67	77.2	27,293
Oxnard, California	A	105,288	32,263	137,551	185	74.4	71,290
Palo Alto, California	A	87,639	79,465	167,104	155	107.9	69,895
Parkersburg, West Virginia	A	46,884	16,209	63,093	99	64.0	35,516
Parma, Ohio	A	64,052	10,513	74,565	114	65.4	43,112

*Extent of Exchange (see page 36)

NOTE: THESE AREAS GENERALLY ARE LARGER THAN THE CORPORATE AREAS OF THE CITIES THEY SERVE

CARRIER TELEPHONE DEVELOPMENT BY LARGE EXCHANGE AREA
DECEMBER 31, 1980

Exchange or Zone Area	Code*	Telephone Instruments			Population (000)	Telephones Per 100 Pop.	Total Main Telephones
		Residence	Business	Total			
Pasadena, California	A	143,822	67,848	211,670	198	106.9	101,137
Pasadena, Texas			(Included in Houston, Texas)				
Passaic, New Jersey	A	112,441	35,846	148,287	178	83.1	84,295
Paterson, New Jersey	A	102,682	30,932	133,614	178	75.0	67,505
Pawtucket, Rhode Island	A	76,703	19,463	96,166	140	68.7	57,464
Pensacola, Florida	A	121,821	43,405	165,226	236	70.1	78,691
Peoria, Illinois	A	154,306	54,547	208,853	197	105.8	87,444
Petersburg, Virginia	A	51,055	11,688	62,743	97	64.7	34,511
Philadelphia, Pennsylvania	B	1,271,147	454,139	1,725,286	1,680	102.7	743,382
Phoenix, Arizona	A	965,972	319,880	1,285,852	1,487	86.5	587,451
Pine Bluff, Arkansas	A	40,880	13,775	54,655	82	66.9	29,277
Pittsburgh, Pennsylvania	A	559,419	265,180	824,599	852	96.8	377,615
Pittsfield, Massachusetts	A	33,323	14,299	47,622	61	78.4	23,810
Plano, Texas	C	NA	NA	63,251	81	77.9	31,487
Point Pleasant, New Jersey	C	61,993	9,559	71,552	78	91.8	41,353
Pomona, California	A	184,533	56,744	241,277	227	106.3	116,728
Pompano Beach, Florida	A	162,152	34,456	196,608	220	89.2	106,882
Pontiac, Michigan	A	97,249	35,583	132,832	166	80.1	61,083
Port Arthur, Texas	A	45,064	12,560	57,624	86	67.0	31,792
Portland, Maine	C	33,414	25,022	58,436	60	98.0	27,612
Portland, Oregon	A	339,687	144,749	484,436	587	82.5	310,589
Portsmouth, Virginia			(Included in Norfolk, Virginia)				
Provo-Orem, Utah	A	61,464	20,175	81,639	144	56.7	40,767
Providence, Rhode Island	A	196,847	94,673	291,520	345	84.4	147,842
Pueblo, Colorado	A	64,487	21,651	86,138	124	69.5	47,781
Quincy, Massachusetts	A	51,729	17,932	66,661	86	81.4	39,240
Racine, Wisconsin	A	74,740	29,440	104,180	129	81.0	51,619
Raleigh, North Carolina	A	152,977	74,978	227,955	229	99.5	96,590
Reading, Pennsylvania	A	121,102	38,568	159,670	185	86.3	78,177
Redondo, California	C	176,168	44,931	221,099	254	87.0	117,196
Redwood City, California	A	46,331	21,870	68,201	81	83.9	37,152
Reno, Nevada	A	118,658	60,573	179,231	185	96.9	86,405
Richardson, Texas	C	71,622	38,640	110,262	101	109.7	43,476
Richmond, California	A	77,140	23,985	101,125	141	71.7	56,087
Richmond, Virginia	A	297,194	111,826	409,020	515	79.5	197,299
Riverside, California	C	149,430	46,153	195,583	248	78.9	97,450
Roanoke, Virginia	A	108,283	32,842	141,125	210	67.2	75,454
Rochester, Minnesota	A	46,200	30,100	76,300	77	98.7	31,400
Roc[illegible]	A	233,942	104,246	338,188	532	63.6	181,902
Ro[illegible]	A	47,993	13,657	61,650	59	104.6	26,872
R[illegible]ois	A	156,478	49,353	205,831	208	99.0	87,761
Rome, Georgia	A	45,381	14,178	59,559	78	76.8	30,263
Roseville, Michigan	A	134,758	25,582	160,340	230	69.8	88,870

*Extent of Exchange (see page 36)

NOTE: THESE AREAS GENERALLY ARE LARGER THAN THE CORPORATE AREAS OF THE CITIES THEY SERVE

CARRIER TELEPHONES BY LARGE EXCHANGES

CARRIER TELEPHONE DEVELOPMENT BY LARGE EXCHANGE AREA
DECEMBER 31, 1980

Exchange or Zone Area	Code*	Telephone Instruments			Population (000)	Telephones Per 100 Pop.	Total Main Telephones
		Residence	Business	Total			
Royal Oak, Michigan	A	162,296	52,256	214,552	254	84.4	113,163
Sacramento, California	C	411,749	185,953	597,702	696	85.9	294,384
Saginaw, Michigan	A	107,700	32,501	140,201	174	80.6	69,602
Salem, Oregon	A	90,702	33,507	124,209	177	70.2	79,532
Salinas, California	A	57,828	20,802	78,630	106	74.5	41,636
Salt Lake City, Utah	A	404,898	148,374	553,272	700	79.1	255,356
San Angelo, Texas	A	NA	NA	69,227	86	80.2	34,960
San Antonio, Texas	C	371,717	151,817	523,534	678	77.2	263,275
San Bernardino, California	C	79,183	34,422	113,605	149	76.2	56,225
San Diego, California	A	353,191	204,356	557,547	609	91.6	275,919
San Francisco, California	A	492,939	395,648	888,587	739	120.2	439,319
San Jose, California	A	489,617	208,925	698,542	866	80.7	351,635
San Mateo, California	A	101,766	39,717	141,483	157	89.9	75,244
Santa Ana, California	C	361,531	203,639	565,170	494	114.4	262,759
Santa Barbara, California	A	105,080	51,884	156,964	152	103.3	78,392
Santa Clara, California		(Included in San Jose, California)					
Santa Monica, California	A	189,279	88,881	278,160	246	113.1	142,627
Santa Rosa, California	A	88,819	31,288	120,107	145	82.8	65,103
Sarasota, Florida	A	108,812	37,016	145,828	133	109.6	86,820
Savannah, Georgia	A	117,093	42,163	159,256	214	74.5	76,984
Schaumburg, Illinois	A	101,819	23,821	125,640	146	86.0	54,484
Schenectady, New York	A	98,714	32,860	131,574	171	76.9	74,446
Scottsdale, Arizona		(Included in Phoenix, Arizona)					
Scranton, Pennsylvania	A	69,620	25,820	95,440	106	90.0	48,954
Seattle, Washington	A	431,770	201,948	633,718	680	93.2	426,288
Shreveport, Louisiana	A	172,912	61,483	234,395	307	76.3	115,498
Simi, California	A	48,108	7,795	55,903	93	60.1	29,027
Sioux City, Iowa	A	58,100	20,700	78,800	100	78.6	37,300
Sioux Falls, South Dakota	A	62,000	25,500	87,500	93	94.4	39,900
Skokie, Illinois	A	111,006	47,639	158,645	119	133.1	63,012
Somerville, Massachusetts	C	41,762	8,601	50,363	89	56.7	33,805
South Bend, Indiana	A	104,700	43,209	147,909	176	83.9	67,035
South San Francisco, California	A	57,449	32,408	89,907	109	82.5	45,492
Southfield, Michigan	C	69,485	58,031	127,516	77	165.9	53,186
Spartanburg, South Carolina	A	73,407	26,769	100,176	144	69.6	48,754
Spokane, Washington	A	183,258	46,723	229,981	325	70.9	139,334
Springfield, Illinois	A	110,646	52,930	163,576	135	120.9	63,796
Springfield, Massachusetts	A	117,267	44,355	161,622	220	73.6	86,345
Springfield, Missouri	A	99,701	37,599	137,300	152	90.0	69,892
Springfield, Ohio	A	60,585	16,281	76,866	112	68.6	41,066
St. Clair Shores, Michigan		(Included in Roseville, Michigan)					
St. Joseph, Missouri	A	51,446	16,151	67,597	79	86.0	35,062
St. Louis, Missouri	C	387,681	203,908	591,589	630	93.9	277,003

*Extent of Exchange (see page 36)

NOTE: THESE AREAS GENERALLY ARE LARGER THAN THE CORPORATE AREAS OF THE CITIES THEY SERVE

CARRIER TELEPHONE DEVELOPMENT BY LARGE EXCHANGE AREA DECEMBER 31, 1980

Exchange or Zone Area	Code*	Telephone Instruments			Population (000)	Telephones Per 100 Pop.	Total Main Telephones
		Residence	Business	Total			
St. Paul, Minnesota		(Included in Minneapolis—St. Paul, Minnesota)					
St. Petersburg, Florida	A	247,377	76,754	324,131	393	82.6	212,873
Stamford, Connecticut	A	78,217	45,371	123,588	103	120.5	53,219
Sterling Heights, Michigan		(Included in Warren, Michigan)					
Stockton, California	A	126,059	40,441	166,500	248	67.1	90,315
Stratford, Connecticut		(Included in Bridgeport, Connecticut)					
Sunnyvale, California	C	66,572	65,241	131,813	123	107.2	52,720
Syracuse, New York	A	170,171	72,771	242,942	339	71.7	131,225
Tacoma, Washington	A	205,298	47,435	252,733	320	79.1	151,451
Tallahassee, Florida	A	76,637	48,431	125,068	147	85.3	72,221
Tampa, Florida	A	320,223	139,236	459,459	600	76.5	279,440
Taunton, Massachusetts	A	31,681	8,084	39,765	57	69.4	22,299
Taylor, Michigan		(Included in Detroit, Michigan)					
Tempe, Arizona		(Included in Phoenix, Arizona)					
Terre Haute, Indiana	A	51,551	30,702	82,253	111	74.2	39,528
Texarkana, Texas	A	NA	NA	64,913	84	77.5	32,294
Thousand Oaks, California	C	62,923	20,236	83,159	94	84.5	38,088
Toledo, Ohio	A	237,353	87,129	324,482	425	76.4	162,771
Toms River, New Jersey	C	68,548	14,767	83,315	102	81.7	46,772
Topeka, Kansas	C	108,874	43,278	152,152	148	102.5	67,931
Torrance, California	C	21,825	17,957	39,782	42	94.7	18,899
Trenton, New Jersey	A	68,824	40,099	108,923	139	78.4	46,480
Troy, Michigan	D	21,387	8,674	30,061	24	126.2	14,775
Troy, New York	A	62,878	14,811	77,689	139	56.1	50,932
Tucson, Arizona	A	308,162	101,711	409,873	512	80.0	218,656
Tulsa, Oklahoma	C	311,258	138,130	449,388	519	86.5	216,880
Tuscaloosa, Alabama	A	71,006	23,921	94,927	137	69.5	48,600
Tyler, Texas	A	62,540	23,736	86,276	111	77.7	42,024
Union City, New Jersey	A	108,123	31,071	139,194	175	79.6	79,138
Unionville, New Jersey	C	41,939	17,758	59,697	53	113.7	30,565
Utica, New York	A	65,734	23,226	88,960	141	63.1	52,628
Valdosta, Georgia	A	31,971	13,595	45,566	60	76.1	21,703
Vallejo, California	A	52,840	17,715	70,555	96	73.5	36,214
Ventura, California	C	44,470	22,036	66,506	69	96.4	35,663
Vineland, New Jersey	C	39,071	12,800	51,871	67	77.3	26,390
Virginia Beach, Virginia		(Included in Norfolk, Virginia)					
Visalia, California	A	45,515	16,023	61,538	77	79.9	32,111
Waco, Texas	A	97,223	34,848	132,071	175	75.5	67,332
Walnut Creek, California	A	71,983	25,894	97,877	112	87.4	51,244
Waltham, Massachusetts	C	40,341	35,965	76,306	80	95.7	32,326
Warren, Michigan	A	127,631	54,441	182,072	228	79.7	83,066
Warren, Ohio	A	54,793	24,888	79,681	126	63.2	43,205
Warwick, Rhode Island	A	32,997	9,097	42,094	61	69.1	23,042

*Extent of Exchange (see page 36)

NOTE: THESE AREAS GENERALLY ARE LARGER THAN THE CORPORATE AREAS OF THE CITIES THEY SERVE

CARRIER TELEPHONES BY LARGE EXCHANGES

CARRIER TELEPHONE DEVELOPMENT BY LARGE EXCHANGE AREA DECEMBER 31, 1980

Exchange or Zone Area	Code*	Telephone Instruments			Population (000)	Telephones Per 100 Pop.	Total Main Telephones
		Residence	Business	Total			
Washington, D.C.	B	522,063	581,194	1,103,257	639	172.7	363,455
Waterbury, Connecticut	A	68,338	23,357	91,695	109	84.3	47,974
Waterloo, Iowa	A	58,600	20,900	79,500	95	83.9	37,200
Waukegan, Illinois	A	77,421	32,670	110,091	125	87.9	45,757
Waukesha, Wisconsin	A	38,778	15,740	54,518	63	87.1	26,684
Wauwatosa, Wisconsin		(Included in Milwaukee, Wisconsin)					
Wayne, Michigan	C	65,186	14,385	79,571	112	71.1	40,250
Wierton, West Virginia	A	37,230	9,128	46,358	72	64.8	25,533
West Allis, Wisconsin		(Included in Milwaukee, Wisconsin)					
West Hartford, Connecticut		(Included in Hartford, Connecticut)					
West Haven, Connecticut		(Included in New Haven, Connecticut)					
West Palm Beach, Florida	A	267,263	82,956	350,219	366	95.8	182,718
Westland, Michigan		(Included in Livonia, Michigan)					
Westminister, California	C	71,571	31,527	103,098	141	73.1	49,408
Weymouth, Massachusetts	A	31,255	5,670	36,925	56	65.5	22,163
Wheeling, West Virginia	A	50,072	17,690	67,762	103	65.8	37,328
White Plains, New York	A	45,169	55,120	100,289	99	101.2	37,683
Whittier, California	A	164,629	51,493	216,122	282	76.6	109,366
Wichita, Kansas	C	174,600	85,734	260,334	389	66.9	117,096
Wichita Falls, Texas	C	60,613	26,939	87,552	123	71.1	42,903
Wilkes-Barre, Pennsylvania	A	54,442	19,848	74,290	87	85.6	38,403
Wilmington, Delaware	A	136,971	75,644	212,615	223	95.3	86,553
Wilmington, North Carolina	A	61,715	21,483	83,198	100	83.1	39,344
Winston-Salem, North Carolina	C	136,419	52,501	188,920	215	87.8	83,468
Winter Park, Florida	A	120,191	46,220	166,411	190	87.5	88,691
Woodbridge, New Jersey	C	21,896	10,633	32,529	36	89.7	16,722
Worcester, Massachusetts	A	101,528	45,060	146,588	200	73.4	78,643
Wyoming, Michigan		(Included in Grand Rapids, Michigan)					
Yonkers, New York	D	67,405	16,250	83,655	128	65.1	52,984
York, Pennsylvania	A	74,627	33,183	107,810	121	89.1	56,544
Youngstown, Ohio	A	154,890	36,162	191,052	264	72.3	100,549

***EXTENT OF EXCHANGE**

A Serves entire city and beyond city
B Serves entire city, but not beyond
C Does not serve entire city, but also serves beyond city
D Does not serve entire city, and does not extend beyond

SOURCE: American Telephone and Telegraph Company

FOREIGN TRADE

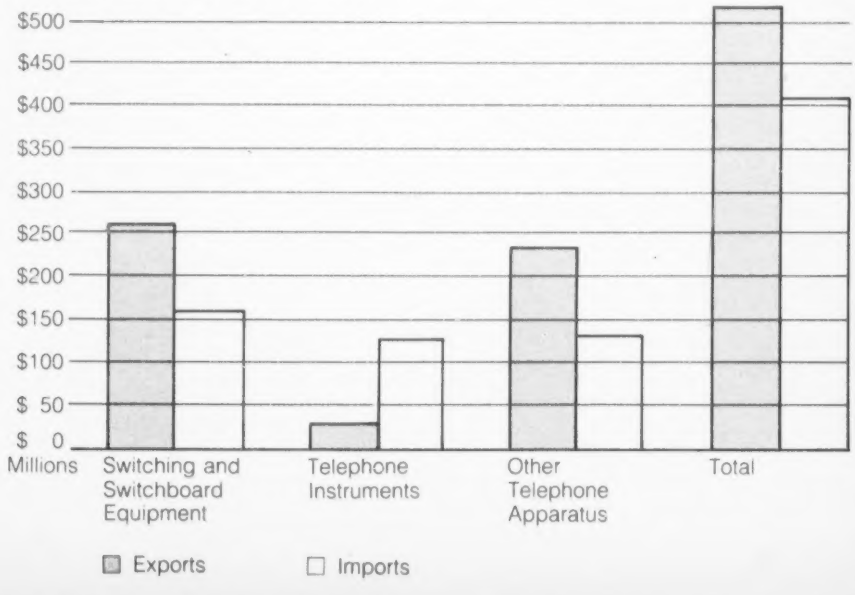
U.S. BALANCE OF TRADE IN TELEPHONE AND TELEPHONE SWITCHING EQUIPMENT: 1981

($000)

Imports	Switching & Switchboard Equipment	Telephone Instruments	Other Telephone Apparatus	Total
Japan	$ 71,835	$ 69,287	$ 50,276	$ 191,398
Canada	61,063	5,190	48,005	114,258
West Europe (EEC)	2,419	1,031	6,778	10,228
Sweden	2,197	16	2,106	4,319
Latin America	5,111	89	4,803	10,003
Israel	6,786	7	7,324	14,117
Far East (excluding Japan)	1,203	50,362	6,943	58,508
Other	410	1,752	1,995	4,157
TOTAL	$ 151,024	$ 127,734	$ 128,230	$ 406,988
Exports				
Japan	$ 3,054	$ 1,192	$ 2,714	$ 6,960
Canada	36,971	6,258	49,503	92,732
West Europe (EEC)	18,841	3,861	26,324	49,026
Sweden	2,405	353	1,516	4,274
Latin America	53,322	6,948	59,944	120,214
Israel	7,085	278	3,054	10,417
Mideast (excluding Israel)	19,875	5,042	26,654	53,571
Far East (excluding Japan)	101,202	1,223	41,527	143,952
Other	18,499	1,658	22,220	42,377
TOTAL	$ 261,254	$ 26,813	$ 235,456	$ 523,523

Figures show a net U.S. surplus for 1981 of $116.5 million. Commerce Department figures indicate that imports of the telephone equipment shown above, plus about $35 million worth of telegraph equipment, accounted for only 4.1 percent of the value of all such equipment "consumed" in the U.S. in 1981.

IMPORTS/EXPORTS: 1981



SOURCE: U.S. Department of Commerce

GLOSSARY

GLOSSARY

American Bell—The unregulated subsidiary that will market new telephone equipment for the entire Bell System after January 1, 1983 and for AT&T (minus the BOCs) after divestiture in early 1984.

BOCs—Bell Operating Companies. The 22 local operating companies that will be divested from AT&T in early 1984 and presumably reorganized into 7 regional operating companies. Before divestiture, they will be limited to marketing equipment in use and in inventory. After divestiture, they will be allowed to market new equipment.

Business Telephone Instruments—All telephones located on a business premises, including phone sets associated with Centrex, PBX and Key systems as well as single-line installations.

Carrier Business Instruments—Business telephone instruments provided by either Bell or the more than 1400 independent telephone companies.

Centrex—Central office equipment used by local operating companies as an alternate to PBX service. The system's switch is located off a customer's premises and connected to individual telephone instruments on a customer's premises.

Churn—The replacement of old equipment with newer equipment without any net change in the installed base of equipment.

Independent—The more than 1400 independent, non-Bell telephone companies, such as United, Continental, and Centel.

Installed Base—Telephone equipment currently installed and in use.

Instrument—Individual telephone set. Either a single-line installation or connected to a Centrex, PBX or Key system. This study measures instruments roughly in terms of lines actually in use, not in terms of a system's capacity.

Interconnect—The approximately 2,300 non-telephone company suppliers of business telephone instruments and systems.

Key—Multi-line telephone designed to provide pushbutton selection of a specific line from several incoming lines.

Migration Strategy—AT&T's pricing plan designed to force existing customers to replace their old Bell equipment with new equipment.

PBX—Private Branch Exchange. A private telephone switching system, located on a customer's premises. A PBX is connected to a common group of incoming lines and provides service to a number of individual telephone sets.

Single-Line Installation—A business telephone instrument providing direct access to the telephone network and not connected to a Centrex, PBX or Key system.

Stand-alone—A Key system directly connected to the telephone network, as opposed to a Key system located behind a PBX.

System—Refers to an entire PBX, Key or Centrex installation, including all individual telephone instruments, wire, cable, and common equipment (switch for PBX and main distribution frame for Key).